Stormwater Management Report

For the:
Proposed Retail Development

Located at:
1682 & 1686 CT Route 12
Town of Ledyard, Connecticut

Prepared for Submission to:
Town of Ledyard, Connecticut

August 1, 2022

Prepared for:
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BL Project Number: 2102412

Contents

Executive Summary

This report shall support the Site Plan Application submitted to the Town of Ledyard by Garrett Homes, LLC for a proposed retail facility located at 1682 and 1686 CT Route 12. The total area of the lot is approximately 182,118 SF or 4.18 Acres.

The existing condition of the site consists of a primarily wooded lot with a house located in the northern half of the site. The subject parcel described above is bounded to the north by a residential house at 1700 CT Route 12, to the east by residential homes on Ferry View Drive, to the south by McDonald's, and to the west by CT Route 12.

The proposed development includes the construction of a +/- 10,700 SF retail building. The development will include parking, landscaping, and additional site and utility improvements typical of commercial development.

Stormwater runoff from paved areas will be collected in catch basins and conveyed to a hydrodynamic separator for treatment prior to infiltration in a stormwater management basin. Clean roof runoff will be collected via gutters and downspouts and be discharged to the paved drainage ditch in the right-of-way via a piped connection. The undeveloped areas on the northern half of the site will retain existing flow regimes. The required water quality treatment for the site will be provided in the hydrodynamic separator upstream of the stormwater management basin. The hydrodynamic separator is further supplemented with two additional best management practices, street sweeping and a stormwater management basin.

A HydroCAD model, using TR-55 and SCS methodology, was developed to evaluate the existing and proposed drainage conditions for the property. The results of the analysis demonstrate a net decrease in the overall stormwater peak flow rates for the 2-, 10-, 25-, and 100-year storm events to all design points.

The analysis as presented within this report complies with the Town of Ledyard Zoning Regulations, the *2002 Connecticut Guidelines for Soil Erosion,* and the *2004 Connecticut Stormwater Quality Manual,* latest editions.

Property Description

Location

The parcel included within this analysis is located at 1682 and 1686 CT Route 12 and includes a bounded area of approximately 182,118 SF or 4.18 Acres. The parcel is currently located within the Gales Ferry Design District (GFDD). The abutting parcels to the north, west and south are all within the GFDD. The abutting parcels to the east are within the R-40 zoning district.

The existing conditions of the lot includes primarily woodland with an existing house, driveway, and some grass.

The existing site provides informal water quality pretreatment through sheet flow over a vegetated surface prior to discharging to the DOT drainage system along Route 12 or to the south.

The subject parcel described above is bounded to the north by a residential house at 1700 CT Route 12, to the east by residential homes on Ferry View Drive, to the south by McDonald's, and to the west by CT Route 12.

A copy of the project location map can be found within Appendix A of this report.

FEMA Flood Insurance Rate Map

Per the FEMA Flood Insurance Rate Map Number 09011C0362J for New London County, Connecticut effective August 5, 2013, the parcel resides entirely within Zone X, an area determined to be outside the 0.2% annual chance floodplain. A copy of the FEMA Flood Insurance Rate Map is included in Appendix A for reference.

Hydrology Modeling and Methodology

Hydrologic Modeling

The SCS Runoff Curve Number and TR-55 Methods were utilized to determine the peak runoff for each drainage area impacted by the proposed development. All supporting calculations have been completed using the stormwater computer modeling program known as HydroCAD, version 10.00, developed by HydroCAD Software Solutions, LLC. Hydrographs for each area were developed using the SCS Synthetic Unit Hydrograph Method and rainfall depths per the NOAA Atlas 14 for Gales Ferry, CT and as shown in Table 1. The drainage areas, or sub-catchments as labeled by the program, are depicted

by hexagons on the attached drainage diagrams in Appendices B and C. Reaches as identified by a rectangle shape within the program are included to clearly define the runoff flow pattern logic to each design point. Existing Conditions HydroCAD results can be found in Appendix B and Proposed Conditions HydroCAD results can be found in Appendix C.

Table 1 – 24-HR Rainfall Depths per NOAA Atlas 14 (Gales Ferry, CT)

Return Period	24-hour Rainfall Depth
2-year	3.46
10-year	5.12
25-year	6.15
100-year	7.75

Hydrologic Assumptions

For the purposes of this report and analysis, the following assumptions have been established:

- The minimum time of concentration shall be 5.0 minutes for all impervious surfaces to comply with the Department of Transportation's requirements.
- The flow path used to calculate the time of concentration terminate at the design points.
- The results noted at each design point are limited to the runoff generated by the development.
- All tributary drainage areas upstream and outside of the site's hydrology analysis of which are not affected by the proposed development have not been included in this analysis and report.
- The results of this analysis do not imply or conclude the adequacy of the existing public storm sewer system and capacity. All pre-development conditions shall be maintained to the ultimate design points as noted at DP-1 and DP-2.

Stormwater Analysis Summary

A hydrologic analysis was performed to quantify the existing and proposed conditions of the site for the 2-, 10-, 25, and 100-year rainfall events. The methodology used is consistent with the SCS method, the TR-55 method, and general engineering principals typical of land development projects of this size.

Due to the existing and proposed topography of the site, two (2) design points were selected for the purposes of this analysis and are noted as DP-1 and DP-2.

DP-1 is located along the western side of the site and estimates the combined runoff rates for the site's overland flow to the west.

DP-2 is located at the southwestern corner of the site and estimates the combined runoff rates for the site's overland flow to the southwest.

All pre-development runoff rates and drainage patterns shall be maintained to the greatest extent feasible.

A copy of the drainage maps showing the design point is included within Appendix F of this report. Additional sections of this report describe and summarize the calculations supporting the design points noted above.

Applicable Local and State Regulations

The existing and proposed analyses presented within this report adhere to the following regulations:

- 2004 Connecticut Stormwater Quality Manual
- 2002 Connecticut Guidelines for Soil Erosion and Sediment Control
- Town of Ledyard Zoning Regulations
- CT DEEP General Stormwater Discharge Permit for Construction Activities

Existing Site and Hydrology Conditions

Existing Site Hydrology

The total existing drainage areas included within this analysis is approximately 6.65 acres with 9.3% being impervious.

The site's runoff consists of two drainage area. The first drainage area includes most of the subject parcel where stormwater flows to the catch basin within the drainage ditch along Route 12. The second drainage area includes the southern quarter of the site which sheet flows directly to the McDonald's parcel. All runoff from each drainage area is released offsite untreated.

Soil Description

The soils included within this stormwater analysis were identified using available online resources created by the United States Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS). They are as follows:

- Charlton-Chatfield Complex, 15-45% slopes, very rocky – Type B soil
- Hollis-Chatfield-Rock Outcrop Complex, 3-45% slopes, very stony – Type D soil
- Udorthents-Urban land complex – Type B Soil

A copy of the USDA NRCS Hydrologic Soil Group map is located within Appendix G of this report.

Existing Topography and Site Features

The existing topography of the property varies from elevation 44 to 122, and generally slopes east to west.

The existing site consists of woodland with some grass and limited amounts of impervious surfaces.

Existing Drainage Areas

The existing drainage areas as shown on the enclosed map titled Existing Drainage Map (ED-1) within Appendix F are as follows:

Existing Drainage Area 100 (EDA-100): EDA-100 consists of the majority of the subject parcel. The drainage area EDA-100 consists of approximately 201,617 square feet and is approximately 10.4% impervious. This area is comprised of woodland, a small building, some grass, and some impervious surfaces. Runoff from this area is conveyed via sheet flow to the west to discharge at DP-1.

Existing Drainage Area 200 (EDA-200): EDA-200 consists of the southern portion of the site. The drainage area EDA-200 consists of approximately 88,001 square feet and is approximately 6.6% impervious. This area is comprised of woodland, grass, and trace impervious surfaces. Runoff from this area is conveyed via sheet flow to the southwest prior to discharge to DP-2.

Existing Conditions Hydrologic Analysis Results

The results of the existing conditions hydrologic analysis are as follows and summarized in Table 2 and Table 3 below

Table 2 –Existing Conditions Drainage Characteristics

Drainage Area	Total Area SF	Composite Curve Number	Imperviousness Cover %	Time of Concentration Minutes
EDA-100	201,617	76	10.4%	14.30
EDA-200	88,001	72	6.6%	14.60

Table 3 – Existing Conditions Peak Flows

Analysis Point	Description	Peak Flows (CFS)			
		2-YR	10-YR	25-YR	100-YR
DP-1	Drainage Ditch	5.36	10.98	14.71	20.68
DP-2	Flow to Southwest	1.82	4.09	5.63	8.15

Proposed Site and Hydrology Conditions

Proposed Site Hydrology

The proposed drainage area included within this analysis generally follows the same assumptions as described above. The total area analyzed is 6.65 acres and is approximately 24.4% impervious. The proposed development includes an increase in impervious area of 43,822 SF.

To mitigate the increase in runoff typical of new development, the following have been proposed for the subject property:

- Addition of an above ground stormwater management basin to infiltrate stormwater and mitigate the increase in peak runoff rates from paved areas within the development and contributing lawn areas.
- Addition of primary water quality treatment in a hydrodynamic separator upstream of the stormwater management basin.
- Addition of secondary water quality treatment such as street sweeping and a formalized O&M Plan.
- Maintaining existing drainage patterns and design points where feasible to ensure that pre-development flow rates are maintained.
- Maintain existing slopes and drainage patterns along property lines to maintain or increase overall flow travel times to discharge location.

The proposed hydrologic analysis for this project maintains the methodologies, design points, and supporting assumptions described above. The intent of the proposed stormwater design is to mimic the existing drainage patterns and runoff flowrates to the greatest extend practical while improving the stormwater quality for the site.

Proposed Topography and Site Features

The proposed topography of the site varies from elevation 44 to 122 and will generally follow the existing drainage patterns to the greatest extent feasible. Catch basins and pipes will collect and route the site's runoff to the respective design point. Primary water quality treatment will be provided in the hydrodynamic separator upstream of the stormwater management basin.

The results of the proposed analysis demonstrate a reduction in the overall stormwater peak flow rates for the 2-, 10-, 25-, and 100-year storm events at design points DP-1 and DP-2.

Proposed Drainage Areas

The proposed drainage areas as shown on the enclosed map titled Proposed Drainage Map (PD-1) within Appendix F are as follows:

Proposed Drainage Area 100 (PDA-100): PDA-100 primarily consists of the wooded areas north of the proposed development from which stormwater runoff will follow existing drainage pathways to Design Point DP-1. It also includes the clean roof runoff from the proposed building. The drainage area PDA-100 consists of approximately 124,577 square feet and is approximately 24.2% impervious. This area is comprised of woodland with some grass and impervious surfaces. Runoff from this area is discharged to the west (DP-1).

Proposed Drainage Area 200 (PDA-200): PDA-200 consists of the southwest corner of the developed site. The drainage area PDA-200 consists of approximately 25,738 square feet and is 26.0% impervious. Runoff from this area is conveyed via sheet flow to the southwest and discharges to DP-2.

Proposed Drainage Area 300 (PDA-300): PDA-300 contains much of the developed portion of the site. The drainage area PDA-300 consists of approximately 60,792 square feet and is 24.3% impervious. Runoff from this area is conveyed via sheet flow into catch basins for collection, is treated in a hydrodynamic separator and discharged to the stormwater management basin. Minimal discharge from the stormwater management basin occurs in the 10-, 25-, and 100-year storms, which will then outlet to the paved drainage ditch along Route 12 (DP-1).

Post-Development Hydrologic Analysis Results

The results of the post-development hydrologic analysis are as follows and summarized in Table 4 and Table 5 below:

Table 4 – Post Development Drainage Characteristics

Drainage Area	Total Area SF	Composite Curve Number	Imperviousness Cover %	Time of Concentration Minutes
PDA-100	124,577	80	24.2%	19.10
PDA-200	25,738	71	26.0%	8.70
PDA-300	139,303	82	24.3%	12.80

Table 5 – Post-Development Conditions Peak Flows

Analysis Point	Description	Peak Flows (CFS)			
		2-YR	10-YR	25-YR	100-YR
DP-1	Drainage Ditch	3.53	6.72	11.62	18.99
DP-2	Flow to Southwest	0.63	1.45	2.02	2.95

The results of the pre-development vs post-development hydrologic analysis are presented below. The results of the analysis demonstrate a decrease in the overall stormwater peak flow rates for the 2-, 10-, 25-, and 100-year storm events at both design points DP-1 and DP-2. As a result, the proposed development will not adversely affect downstream infrastructure and properties located within the regional watershed.

Table 6 – Existing vs Proposed Peak Rates of Runoff

	Design Storms			
Analysis Point	**2-YR**	**10-YR**	**25-YR**	**100-YR**
DP-1				
Existing	5.36	10.98	14.71	20.68
Proposed	3.53	6.72	11.62	18.99
Percent Change	-34.14%	-38.80%	-21.01%	-8.17%
DP-2				
Existing	1.82	4.09	5.63	8.15
Proposed	0.63	1.45	2.02	2.95
Percent Change	-65.38%	-64.55%	-64.12%	-63.80%

Description of Proposed Stormwater Management System

The proposed stormwater management system will function to capture, route, treat, detain, and discharge the onsite runoff to the west and southwest without adversely impacting the downstream conditions, to the greatest extent feasible. As noted within previous sections of this report, the existing conditions drainage patterns shall be maintained at design points DP-1 and DP-2 within the proposed conditions. This will be accomplished by the following:

1. Balancing the site's hydrologic drainage areas to match the existing conditions along the southeast side of the property.
2. Installation of a stormwater management basin to infiltrate and detain the required runoff to match the site's existing conditions.
3. Implementing the use of a hydrodynamic separator to treat stormwater runoff upstream of the stormwater management basin.

Hydraulic Analysis

Preliminary Hydraulics

The hydraulic study of the on-site drainage system has been designed to comply with the requirements set forth in the Town of Ledyard Zoning Regulations and the State of Connecticut Department of Transportation Drainage Manual.

The proposed drainage systems have been sized to convey the 10-year storm event to their respective discharge points without ponding or surcharging above the catch basin / manhole grates. NOAA Atlas-14 rainfall intensity for Gales Ferry was utilized and is included in Appendix A. The site drainage system improvements have been designed to comply with the requirements set forth in the State of Connecticut Department of Transportation Drainage Manual, dated 2000, as amended. The proposed drainage areas contributing to each catch basin have been determined as shown on the enclosed map titled Proposed Drainage Map (PD-2) within Appendix F.

The minimum pipe size maintained onsite is 12 inches.

The runoff coefficients for each inlet drainage area have been calculated as the weighted average of impervious and pervious surfaces contributing to the runoff. Impervious surfaces including asphalt pavement, concrete pavement, and building roof area were computed using a rational runoff coefficient of 0.90. Pervious surfaces including lawn and landscaped area were computing using a rational runoff coefficient of 0.30.

Tailwater elevations for the stormwater management areas and flared end sections are based on the 10-year design storm.

StormCAD version 8i by Haestad Methods, utilizing the Rational Method, was used to model the proposed drainage system. Calculation data can be found in Appendix D.

The proposed culvert under the driveway was designed using the flows from the Rational Method model in accordance with the CTDOT Highway drainage manual. The flows generated from the Rational Method Hydrocad model were imported into Hydraflow Express and a culvert analysis was generated. This information can be found in Appendix D.

Proposed Permanent BMP's and Water Quality

The required water quality treatment for this site will be provided in a hydrodynamic separator upstream of the stormwater management basin. The hydrodynamic separator will provide the required treatment of the 1" storm for the entire site. To extend the life of the hydrodynamic separator, secondary water quality treatment will be provided via street sweeping and the stormwater management basin. The proposed BMP's will result in a TSS removal of 80% or greater.

Additional BMPs such as a formalized street sweeping program are included within the site's stormwater management system and Stormwater Operation and Maintenance Plan. A copy of the site's O&M Plan can be found in Appendix H of this report. A copy of this Plan shall be provided to the tenant after the completion of the project.

Overall, the existing parcel's water quality will be improved as formal water quality treatment measures do not exist today. The proposed development will thus bring the site into conformance with today's stormwater and water quality standards.

Summary

The stormwater analysis presented within this report complies with the *Town of Ledyard Zoning Regulations,* the *2002 Connecticut Guidelines for Soil Erosion,* and the *2004 Connecticut Stormwater Quality Manual,* latest editions.

The proposed stormwater management system has been designed to maintain the existing drainage patterns and pre-development conditions for the 2-, 10-, 25-, and 100-year storm events to the greatest extent feasible. All water quality treatment will be

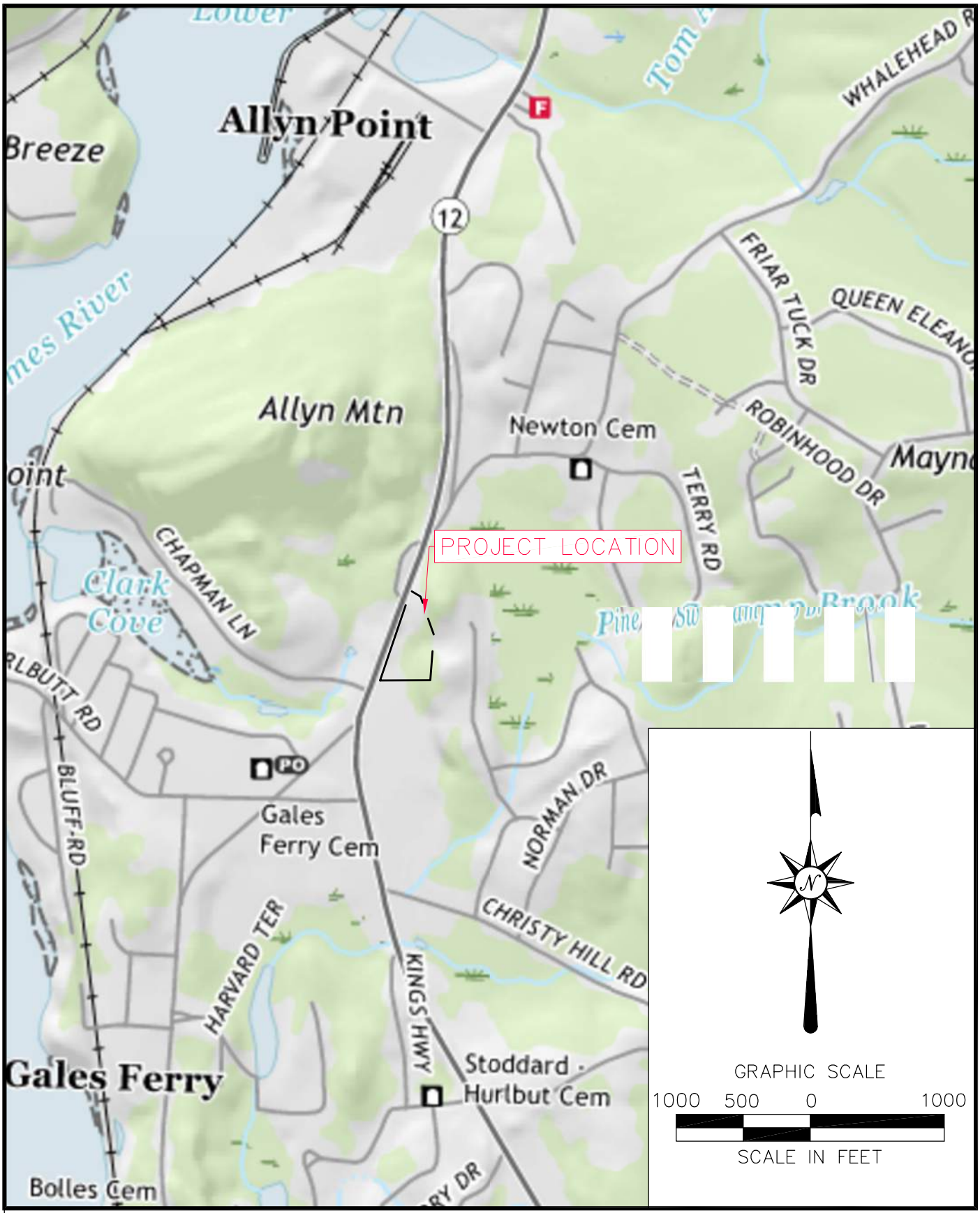
provided through a hydrodynamic separator located upstream of the stormwater management basin and further be supplemented by BMP's such as street sweeping.

The proposed development and stormwater improvements described within this report decrease peak flowrates for the 2-, 10-, 25-, and 100-year rainfall events for the site. Thus, the proposed development will not adversely impact the downstream stormwater conditions due to the proposed activity and improvements included within this report.

APPENDIX A

Location Maps

Figure 1: USGS Location Map
Figure 2: Aerial Location Map
Figure 3: FEMA Flood Insurance Rate Map
Figure 4: NOAA Atlas 14 Storm Data (Depth, Inches)
Figure 5: NOAA Atlas 14 Storm Data (Intensity, Inches/Hour)

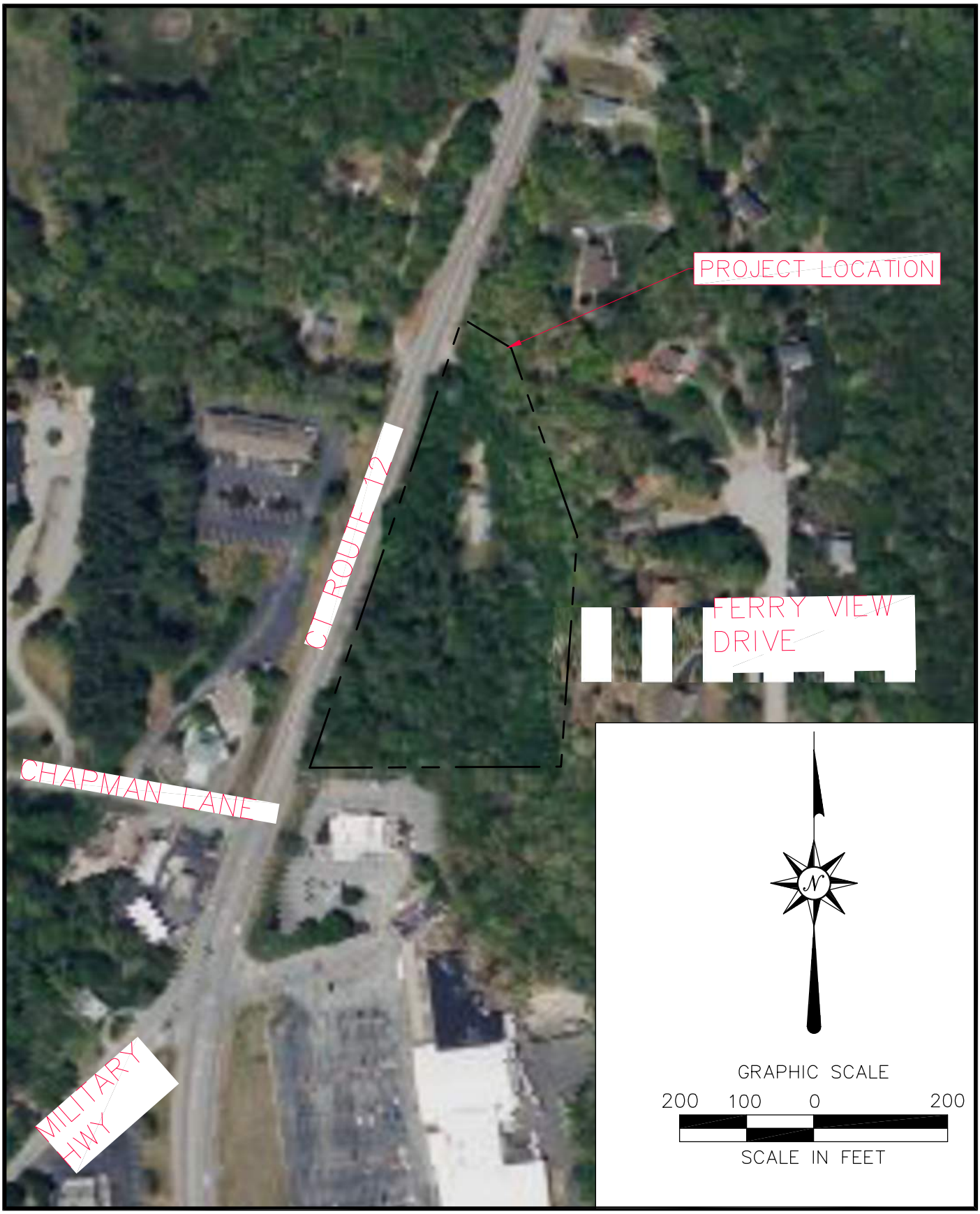


BL Companies
ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

PROPOSED RETAIL DEVELOPMENT
1682 & 1686 ROUTE 12
GALES FERRY, CONNECTICUT

Designed	T.A.H.
Drawn	T.A.H.
Checked	T.A.H.
Approved	T.A.H.
Scale	1"=1000'
Project No.	2102412
Date	06/21/2022
CAD File	EXH210241201

FIGURE 1
USGS LOCATION MAP



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ARCHITECTURE
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LAND SURVEYING

PROPOSED RETAIL DEVELOPMENT

1682 & 1686 CT ROUTE 12
GALES FERRY, CONNECTICUT

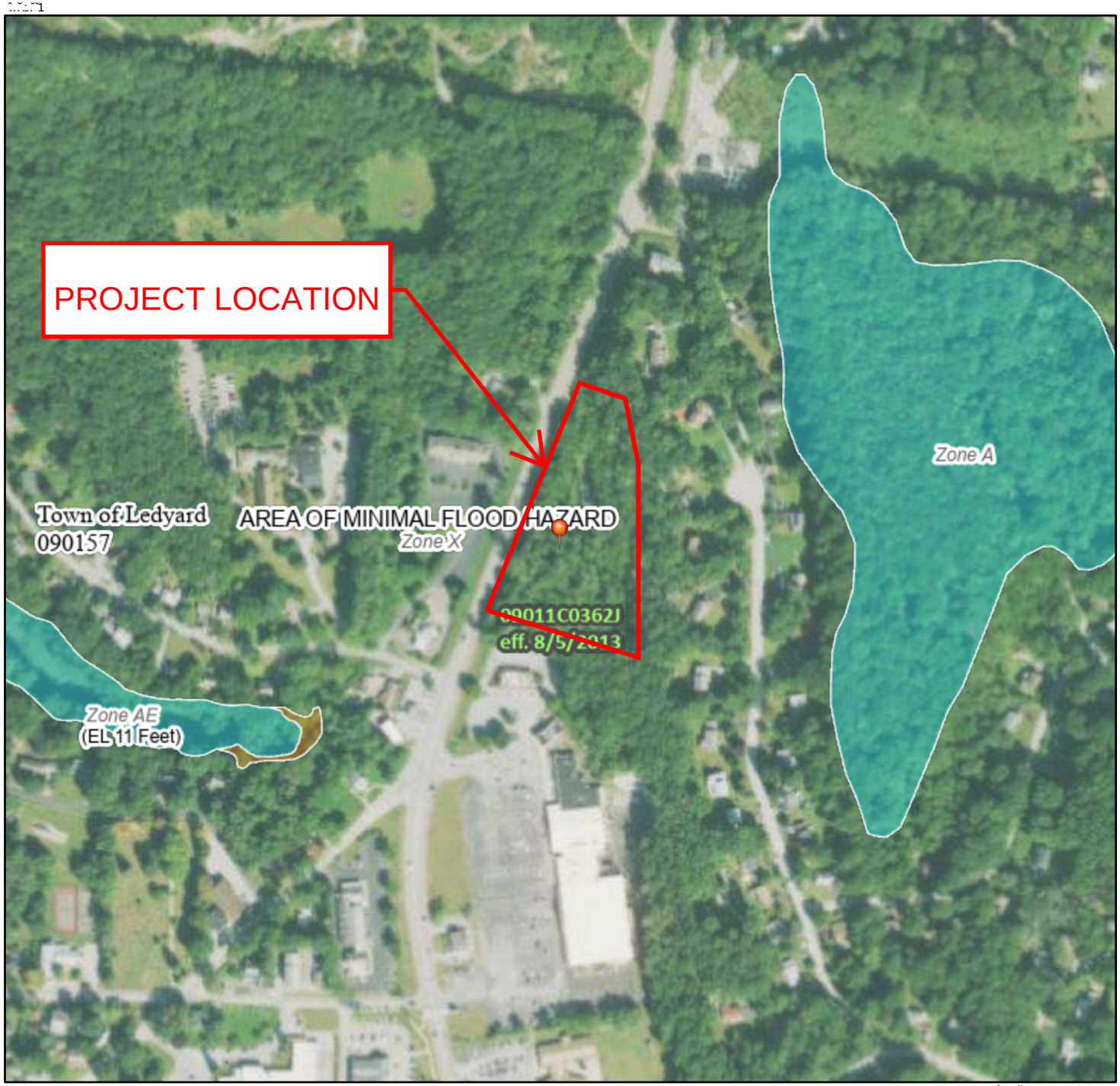
Designed	T.A.H.
Drawn	T.A.H.
Checked	T.A.H.
Approved	T.A.H.
Scale	1"=200'
Project No.	2102412
Date	6/20/2022
CAD File	EXH210241201

FIGURE 2

AERIAL LOCATION MAP

1DWLRQDO)ORRG+D]DUG/DHU)6WWH

FEMA



)HHW

%DVHPDS 86 DWLRQDO 2FHDQLF DQG $WPRVSKHULF $GPLQLVWUDWLRQ

NOAA Atlas 14, Volume 10, Version 3
Location name: Gales Ferry, Connecticut, USA*
Latitude: 41.4309°, Longitude: -72.0817°
Elevation: 42.19 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.341** (0.266-0.431)	**0.407** (0.317-0.515)	**0.515** (0.400-0.653)	**0.605** (0.467-0.769)	**0.728** (0.545-0.958)	**0.821** (0.601-1.10)	**0.919** (0.654-1.26)	**1.03** (0.693-1.43)	**1.19** (0.771-1.70)	**1.32** (0.836-1.91)
10-min	**0.483** (0.377-0.610)	**0.577** (0.449-0.729)	**0.730** (0.567-0.925)	**0.857** (0.661-1.09)	**1.03** (0.771-1.36)	**1.16** (0.852-1.55)	**1.30** (0.927-1.79)	**1.46** (0.982-2.03)	**1.68** (1.09-2.40)	**1.87** (1.18-2.71)
15-min	**0.568** (0.443-0.718)	**0.678** (0.528-0.858)	**0.858** (0.666-1.09)	**1.01** (0.778-1.28)	**1.21** (0.908-1.60)	**1.37** (1.00-1.83)	**1.53** (1.09-2.11)	**1.72** (1.16-2.39)	**1.98** (1.28-2.83)	**2.20** (1.39-3.19)
30-min	**0.805** (0.628-1.02)	**0.960** (0.748-1.21)	**1.21** (0.942-1.54)	**1.42** (1.10-1.81)	**1.71** (1.28-2.25)	**1.93** (1.41-2.58)	**2.16** (1.54-2.97)	**2.42** (1.63-3.37)	**2.79** (1.81-3.99)	**3.10** (1.97-4.50)
60-min	**1.04** (0.812-1.32)	**1.24** (0.967-1.57)	**1.57** (1.22-1.99)	**1.84** (1.42-2.34)	**2.21** (1.65-2.91)	**2.49** (1.83-3.33)	**2.79** (1.98-3.83)	**3.12** (2.10-4.34)	**3.61** (2.34-5.15)	**4.01** (2.54-5.80)
2-hr	**1.37** (1.08-1.71)	**1.63** (1.28-2.04)	**2.06** (1.61-2.58)	**2.41** (1.88-3.04)	**2.90** (2.19-3.79)	**3.27** (2.41-4.33)	**3.66** (2.62-4.99)	**4.10** (2.78-5.65)	**4.74** (3.09-6.71)	**5.27** (3.35-7.58)
3-hr	**1.59** (1.25-1.98)	**1.89** (1.49-2.36)	**2.38** (1.88-2.98)	**2.79** (2.19-3.51)	**3.36** (2.54-4.36)	**3.78** (2.81-4.99)	**4.23** (3.05-5.74)	**4.74** (3.22-6.51)	**5.49** (3.59-7.73)	**6.11** (3.89-8.73)
6-hr	**2.01** (1.61-2.49)	**2.39** (1.91-2.95)	**3.01** (2.39-3.73)	**3.52** (2.78-4.38)	**4.22** (3.23-5.43)	**4.75** (3.55-6.21)	**5.31** (3.85-7.15)	**5.95** (4.07-8.10)	**6.88** (4.52-9.61)	**7.65** (4.90-10.8)
12-hr	**2.48** (2.00-3.04)	**2.94** (2.37-3.60)	**3.69** (2.96-4.54)	**4.32** (3.44-5.32)	**5.17** (3.98-6.60)	**5.82** (4.38-7.54)	**6.50** (4.75-8.67)	**7.28** (5.01-9.82)	**8.41** (5.56-11.6)	**9.36** (6.02-13.1)
24-hr	**2.90** (2.36-3.52)	**3.46** (2.81-4.20)	**4.36** (3.53-5.31)	**5.12** (4.11-6.25)	**6.15** (4.78-7.78)	**6.92** (5.26-8.91)	**7.75** (5.71-10.3)	**8.71** (6.03-11.6)	**10.1** (6.72-13.9)	**11.3** (7.31-15.8)
2-day	**3.24** (2.66-3.90)	**3.90** (3.20-4.70)	**4.98** (4.07-6.01)	**5.88** (4.77-7.11)	**7.11** (5.57-8.93)	**8.02** (6.16-10.3)	**9.00** (6.71-11.9)	**10.2** (7.09-13.5)	**11.9** (7.97-16.3)	**13.5** (8.74-18.6)
3-day	**3.52** (2.90-4.21)	**4.23** (3.49-5.06)	**5.39** (4.43-6.47)	**6.36** (5.19-7.66)	**7.69** (6.06-9.61)	**8.67** (6.69-11.0)	**9.74** (7.29-12.8)	**11.0** (7.69-14.5)	**12.9** (8.65-17.5)	**14.6** (9.50-20.0)
4-day	**3.77** (3.13-4.50)	**4.52** (3.74-5.39)	**5.74** (4.73-6.86)	**6.76** (5.53-8.11)	**8.15** (6.45-10.1)	**9.19** (7.11-11.6)	**10.3** (7.73-13.5)	**11.6** (8.15-15.3)	**13.6** (9.14-18.4)	**15.3** (10.0-21.0)
7-day	**4.50** (3.76-5.32)	**5.31** (4.43-6.29)	**6.65** (5.52-7.88)	**7.75** (6.40-9.23)	**9.27** (7.38-11.4)	**10.4** (8.09-13.1)	**11.6** (8.74-15.0)	**13.0** (9.18-17.0)	**15.1** (10.2-20.3)	**16.9** (11.1-23.0)
10-day	**5.21** (4.38-6.13)	**6.07** (5.08-7.14)	**7.46** (6.23-8.81)	**8.62** (7.15-10.2)	**10.2** (8.15-12.5)	**11.4** (8.89-14.2)	**12.7** (9.54-16.2)	**14.1** (9.97-18.3)	**16.2** (11.0-21.6)	**17.9** (11.8-24.3)
20-day	**7.41** (6.28-8.63)	**8.32** (7.04-9.70)	**9.80** (8.26-11.5)	**11.0** (9.24-13.0)	**12.7** (10.2-15.4)	**14.0** (11.0-17.2)	**15.4** (11.5-19.3)	**16.7** (11.9-21.5)	**18.6** (12.7-24.5)	**20.0** (13.2-26.9)
30-day	**9.23** (7.87-10.7)	**10.2** (8.66-11.8)	**11.7** (9.94-13.6)	**13.0** (11.0-15.2)	**14.8** (11.9-17.7)	**16.2** (12.7-19.6)	**17.5** (13.2-21.7)	**18.8** (13.5-24.0)	**20.5** (14.0-26.8)	**21.7** (14.4-28.9)
45-day	**11.5** (9.84-13.2)	**12.5** (10.7-14.4)	**14.1** (12.0-16.3)	**15.5** (13.1-18.0)	**17.3** (14.1-20.6)	**18.8** (14.8-22.6)	**20.2** (15.2-24.8)	**21.5** (15.5-27.3)	**23.0** (15.8-29.9)	**23.9** (15.9-31.8)
60-day	**13.3** (11.5-15.3)	**14.4** (12.4-16.5)	**16.1** (13.8-18.6)	**17.6** (14.9-20.3)	**19.5** (15.9-23.1)	**21.1** (16.7-25.3)	**22.6** (17.0-27.5)	**23.8** (17.2-30.1)	**25.2** (17.4-32.7)	**26.0** (17.5-34.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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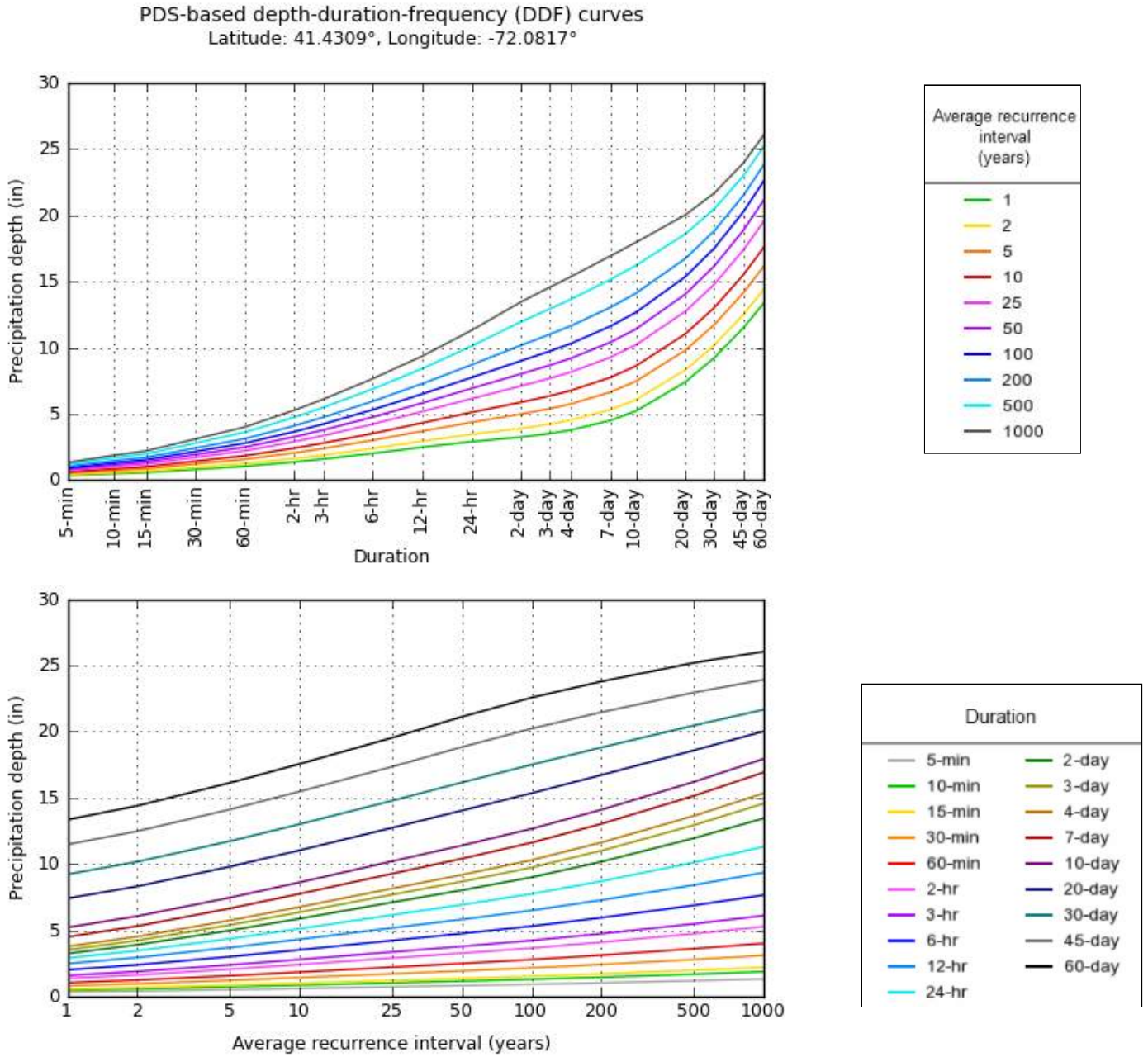
PF graphical



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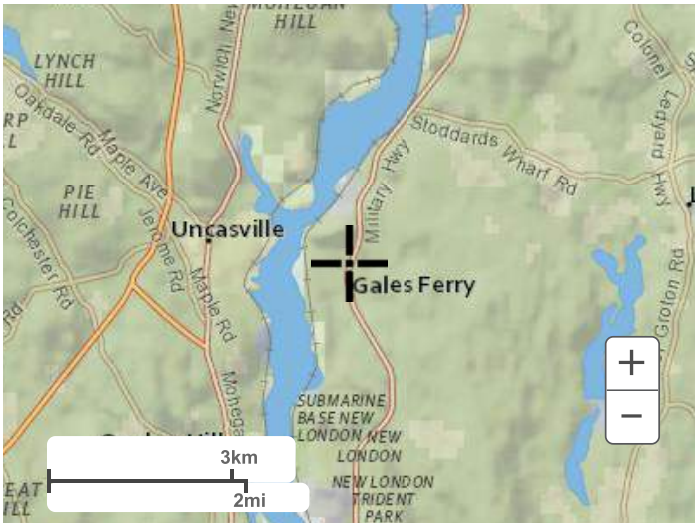
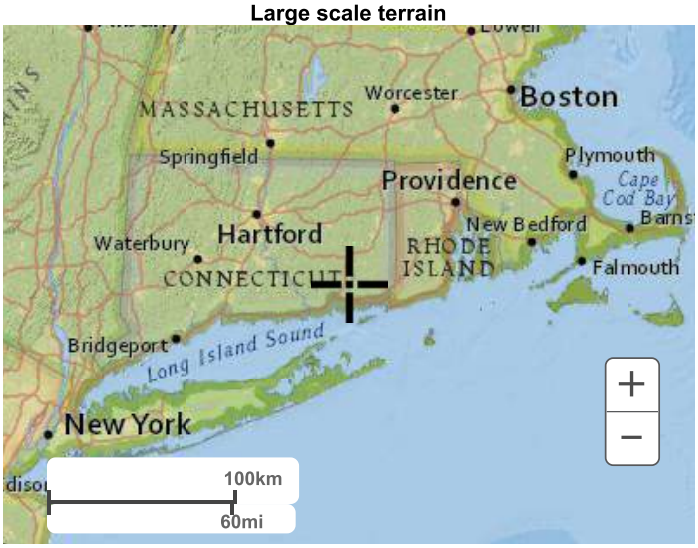
Maps & aerials

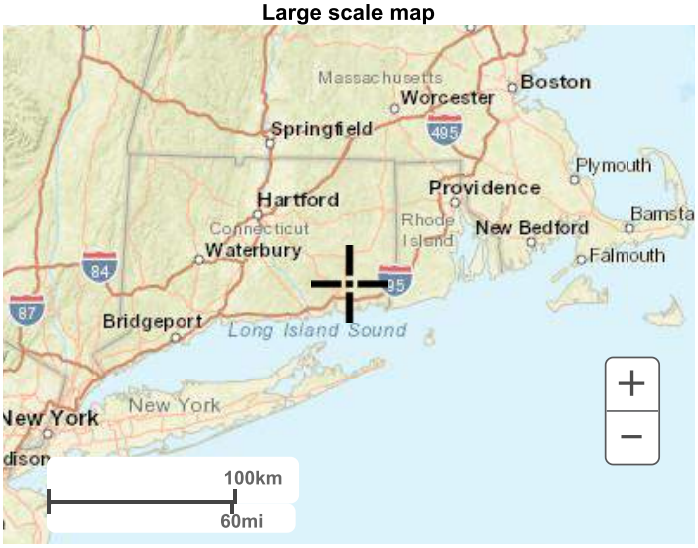
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 10, Version 3
Location name: Gales Ferry, Connecticut, USA*
Latitude: 41.4309°, Longitude: -72.0817°
Elevation: 42.19 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.09 (3.19-5.17)	4.88 (3.80-6.18)	6.18 (4.80-7.84)	7.26 (5.60-9.23)	8.74 (6.54-11.5)	9.85 (7.21-13.2)	11.0 (7.85-15.2)	12.4 (8.32-17.2)	14.3 (9.25-20.4)	15.9 (10.0-23.0)
10-min	2.90 (2.26-3.66)	3.46 (2.69-4.37)	4.38 (3.40-5.55)	5.14 (3.97-6.55)	6.19 (4.63-8.14)	6.98 (5.11-9.32)	7.81 (5.56-10.7)	8.75 (5.89-12.2)	10.1 (6.55-14.4)	11.2 (7.10-16.3)
15-min	2.27 (1.77-2.87)	2.71 (2.11-3.43)	3.43 (2.66-4.35)	4.03 (3.11-5.13)	4.86 (3.63-6.39)	5.47 (4.01-7.31)	6.12 (4.36-8.42)	6.86 (4.62-9.54)	7.93 (5.14-11.3)	8.80 (5.57-12.8)
30-min	1.61 (1.26-2.03)	1.92 (1.50-2.43)	2.43 (1.88-3.08)	2.85 (2.20-3.63)	3.43 (2.56-4.51)	3.86 (2.83-5.16)	4.32 (3.07-5.94)	4.84 (3.26-6.73)	5.59 (3.62-7.97)	6.21 (3.93-8.99)
60-min	1.04 (0.812-1.32)	1.24 (0.967-1.57)	1.57 (1.22-1.99)	1.84 (1.42-2.34)	2.21 (1.65-2.91)	2.49 (1.83-3.33)	2.79 (1.98-3.83)	3.12 (2.10-4.34)	3.61 (2.34-5.15)	4.01 (2.54-5.80)
2-hr	0.684 (0.538-0.856)	0.814 (0.640-1.02)	1.03 (0.806-1.29)	1.21 (0.939-1.52)	1.45 (1.09-1.89)	1.63 (1.21-2.17)	1.83 (1.31-2.49)	2.05 (1.39-2.83)	2.37 (1.54-3.35)	2.64 (1.68-3.79)
3-hr	0.528 (0.418-0.659)	0.629 (0.497-0.785)	0.794 (0.625-0.992)	0.930 (0.728-1.17)	1.12 (0.847-1.45)	1.26 (0.934-1.66)	1.41 (1.01-1.91)	1.58 (1.07-2.17)	1.83 (1.19-2.57)	2.03 (1.30-2.91)
6-hr	0.336 (0.268-0.415)	0.399 (0.318-0.493)	0.502 (0.399-0.622)	0.588 (0.464-0.731)	0.705 (0.539-0.907)	0.793 (0.593-1.04)	0.887 (0.643-1.19)	0.993 (0.680-1.35)	1.15 (0.755-1.61)	1.28 (0.819-1.81)
12-hr	0.206 (0.166-0.252)	0.244 (0.196-0.299)	0.307 (0.246-0.376)	0.358 (0.285-0.442)	0.429 (0.331-0.548)	0.483 (0.364-0.626)	0.539 (0.394-0.720)	0.604 (0.416-0.815)	0.698 (0.461-0.967)	0.777 (0.500-1.09)
24-hr	0.121 (0.098-0.147)	0.144 (0.117-0.175)	0.182 (0.147-0.221)	0.213 (0.171-0.260)	0.256 (0.199-0.324)	0.288 (0.219-0.371)	0.323 (0.238-0.428)	0.363 (0.251-0.485)	0.422 (0.280-0.579)	0.471 (0.305-0.657)
2-day	0.068 (0.055-0.081)	0.081 (0.067-0.098)	0.104 (0.085-0.125)	0.122 (0.099-0.148)	0.148 (0.116-0.186)	0.167 (0.128-0.214)	0.188 (0.140-0.248)	0.212 (0.148-0.281)	0.249 (0.166-0.339)	0.280 (0.182-0.387)
3-day	0.049 (0.040-0.058)	0.059 (0.048-0.070)	0.075 (0.062-0.090)	0.088 (0.072-0.106)	0.107 (0.084-0.133)	0.120 (0.093-0.153)	0.135 (0.101-0.178)	0.153 (0.107-0.202)	0.180 (0.120-0.243)	0.202 (0.132-0.278)
4-day	0.039 (0.033-0.047)	0.047 (0.039-0.056)	0.060 (0.049-0.071)	0.070 (0.058-0.084)	0.085 (0.067-0.106)	0.096 (0.074-0.121)	0.107 (0.080-0.140)	0.121 (0.085-0.159)	0.142 (0.095-0.192)	0.160 (0.104-0.219)
7-day	0.027 (0.022-0.032)	0.032 (0.026-0.037)	0.040 (0.033-0.047)	0.046 (0.038-0.055)	0.055 (0.044-0.068)	0.062 (0.048-0.078)	0.069 (0.052-0.089)	0.078 (0.055-0.101)	0.090 (0.061-0.121)	0.101 (0.066-0.137)
10-day	0.022 (0.018-0.026)	0.025 (0.021-0.030)	0.031 (0.026-0.037)	0.036 (0.030-0.043)	0.043 (0.034-0.052)	0.048 (0.037-0.059)	0.053 (0.040-0.068)	0.059 (0.042-0.076)	0.068 (0.046-0.090)	0.075 (0.049-0.101)
20-day	0.015 (0.013-0.018)	0.017 (0.015-0.020)	0.020 (0.017-0.024)	0.023 (0.019-0.027)	0.027 (0.021-0.032)	0.029 (0.023-0.036)	0.032 (0.024-0.040)	0.035 (0.025-0.045)	0.039 (0.026-0.051)	0.042 (0.028-0.056)
30-day	0.013 (0.011-0.015)	0.014 (0.012-0.016)	0.016 (0.014-0.019)	0.018 (0.015-0.021)	0.021 (0.017-0.025)	0.022 (0.018-0.027)	0.024 (0.018-0.030)	0.026 (0.019-0.033)	0.028 (0.019-0.037)	0.030 (0.020-0.040)
45-day	0.011 (0.009-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.017)	0.016 (0.013-0.019)	0.017 (0.014-0.021)	0.019 (0.014-0.023)	0.020 (0.014-0.025)	0.021 (0.015-0.028)	0.022 (0.015-0.029)
60-day	0.009 (0.008-0.011)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.012 (0.010-0.014)	0.014 (0.011-0.016)	0.015 (0.012-0.018)	0.016 (0.012-0.019)	0.017 (0.012-0.021)	0.017 (0.012-0.023)	0.018 (0.012-0.024)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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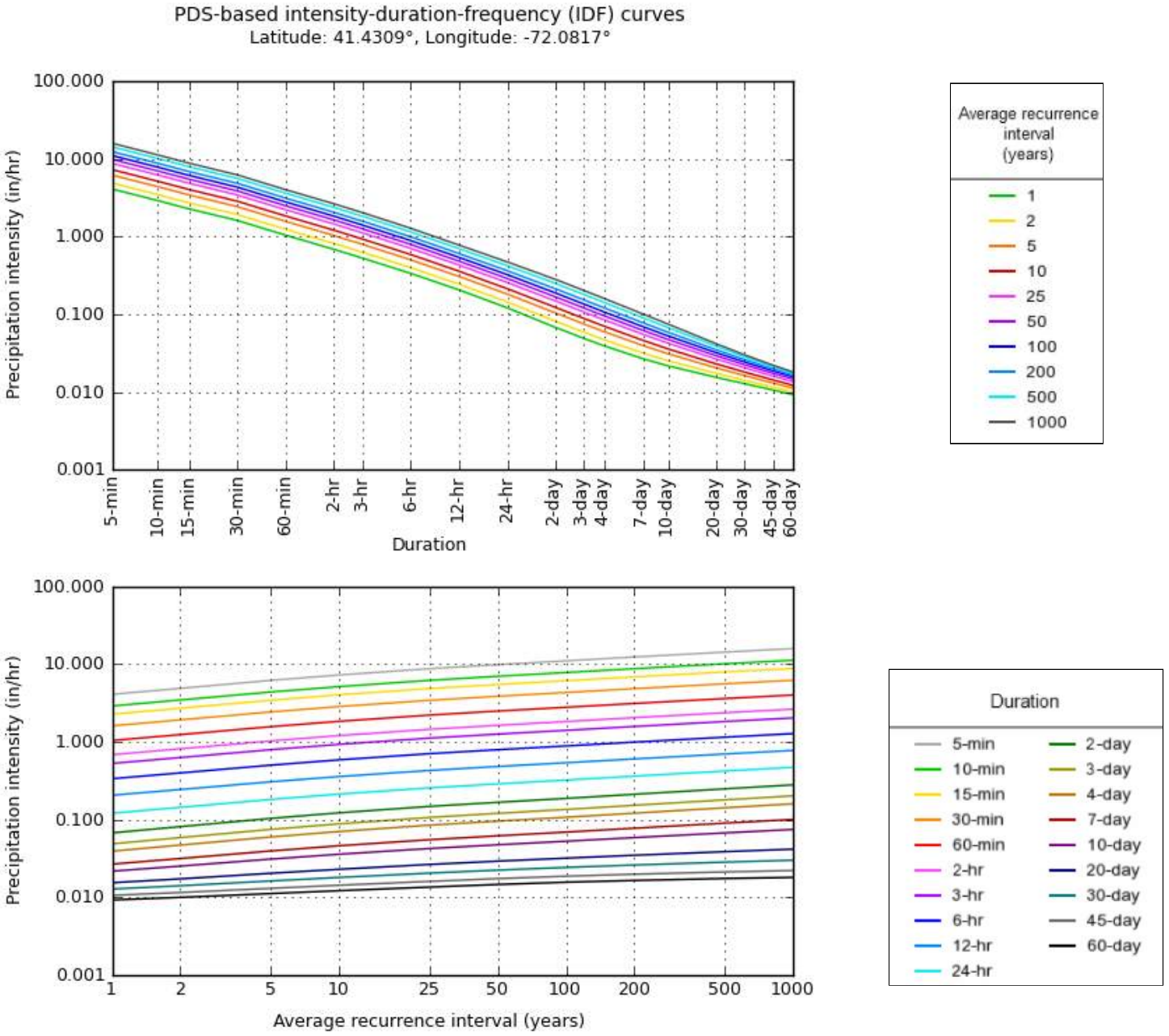
PF graphical



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Created (GMT): Thu Jul 21 12:24:52 2022

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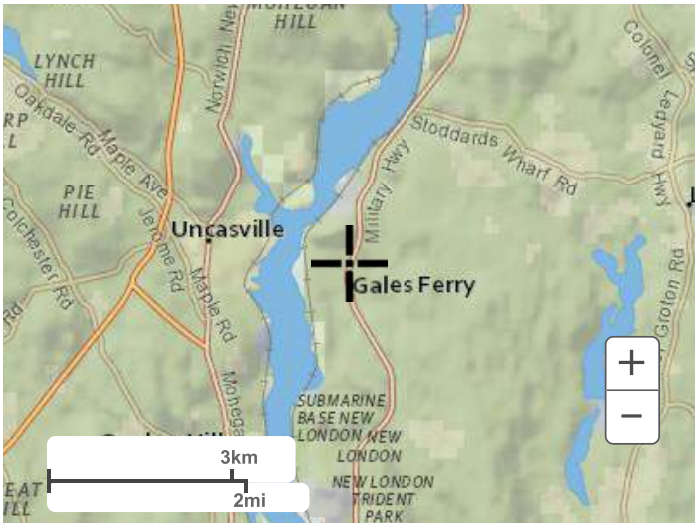
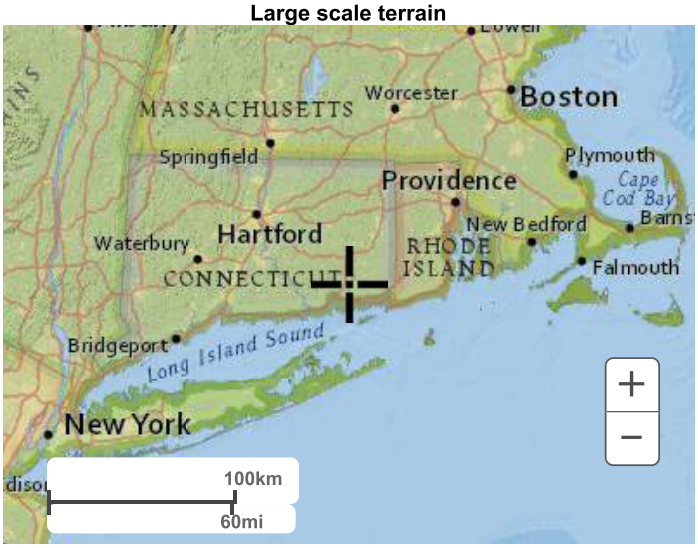
Maps & aerials

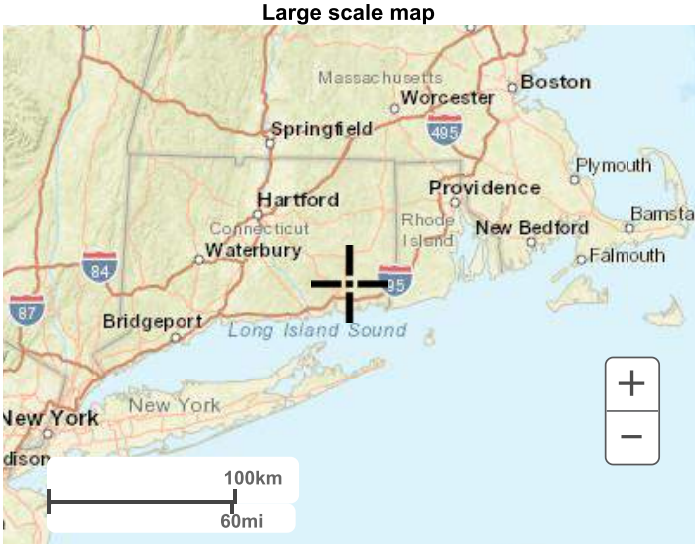
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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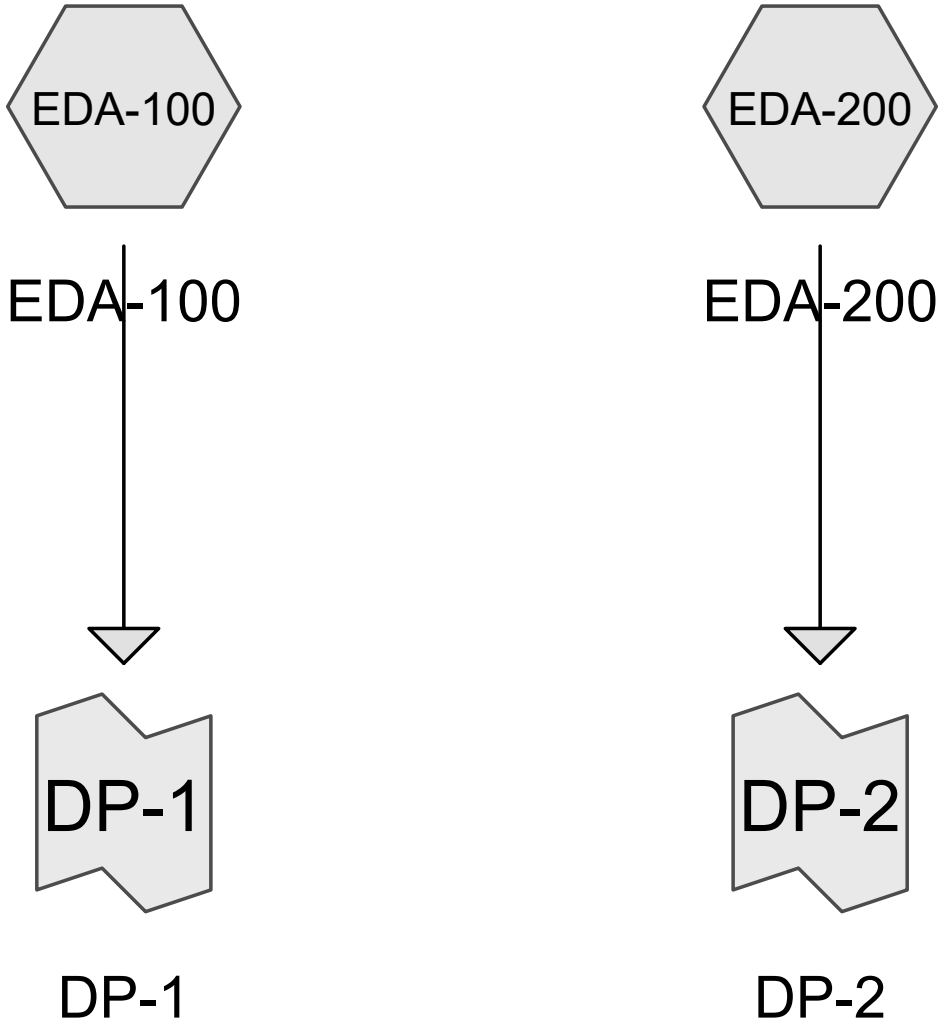
APPENDIX B

Existing Conditions Hydrology
(2-, 10-, 25-, and 100-year storms)



Subcat Reach Pond Link

Routing Diagram for C-DAT-2102412-EX HYDRO
Prepared by BL Companies, Printed 7/17/2022

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-100: EDA-100 Runoff Area=201,617 sf 8.95% Impervious Runoff Depth=1.34"
Flow Length=443' Tc=14.3 min CN=76 Runoff=5.36 cfs 22,453 cf

Subcatchment EDA-200: EDA-200 Runoff Area=88,001 sf 6.62% Impervious Runoff Depth=1.09"
Flow Length=571' Tc=14.6 min CN=72 Runoff=1.82 cfs 8,029 cf

Link DP-1: DP-1 Inflow=5.36 cfs 22,453 cf
Primary=5.36 cfs 22,453 cf

Link DP-2: DP-2 Inflow=1.82 cfs 8,029 cf
Primary=1.82 cfs 8,029 cf

Total Runoff Area = 289,618 sf Runoff Volume = 30,482 cf Average Runoff Depth = 1.26"
91.76% Pervious = 265,759 sf 8.24% Impervious = 23,859 sf

Summary for Subcatchment EDA-100: EDA-100

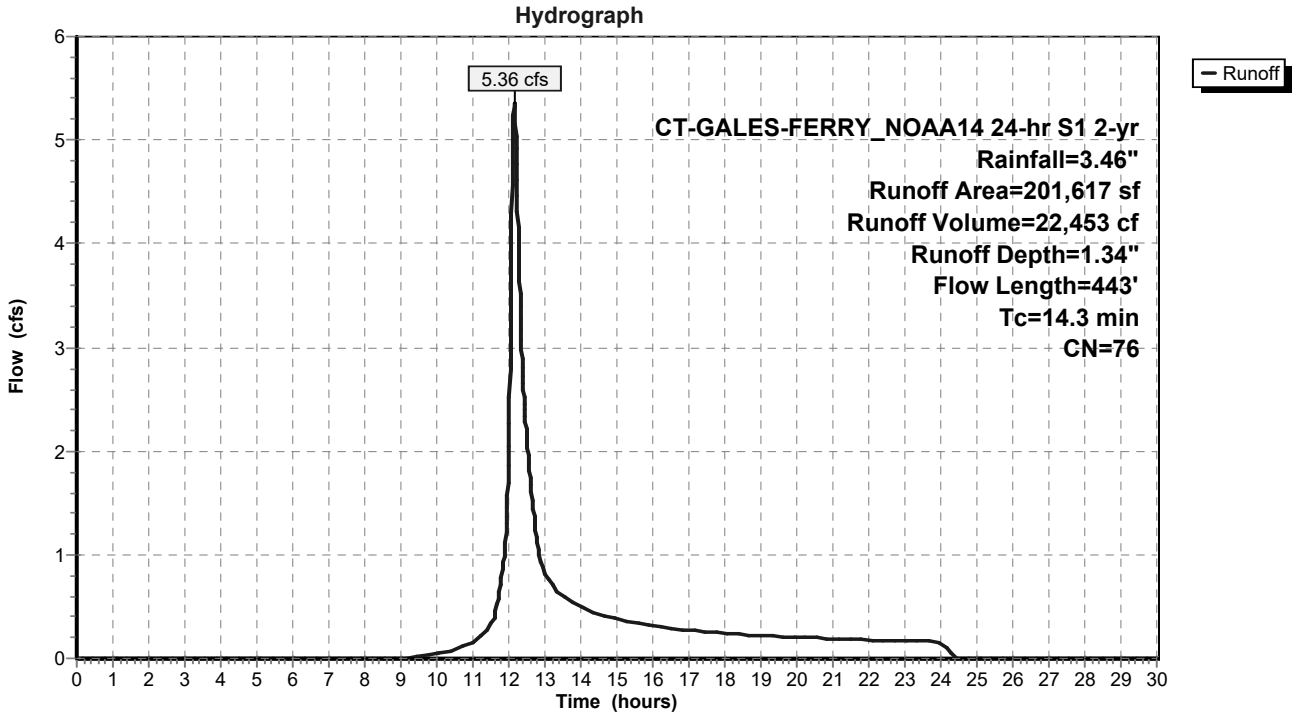
Runoff = 5.36 cfs @ 12.15 hrs, Volume= 22,453 cf, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 2-yr Rainfall=3.46"

Area (sf)	CN	Description
39,441	60	Woods, Fair, HSG B
117,872	79	Woods, Fair, HSG D
15,868	61	>75% Grass cover, Good, HSG B
7,401	80	>75% Grass cover, Good, HSG D
7,261	98	Paved parking, HSG B
6,541	98	Paved parking, HSG D
152	96	Gravel surface, HSG B
2,848	96	Gravel surface, HSG D
1,914	98	Roofs, HSG B
2,319	98	Roofs, HSG D
201,617	76	Weighted Average
183,582		91.05% Pervious Area
18,035		8.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.2	42	0.4000	3.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	182	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	98	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.3	443	Total			

Subcatchment EDA-100: EDA-100



Summary for Subcatchment EDA-200: EDA-200

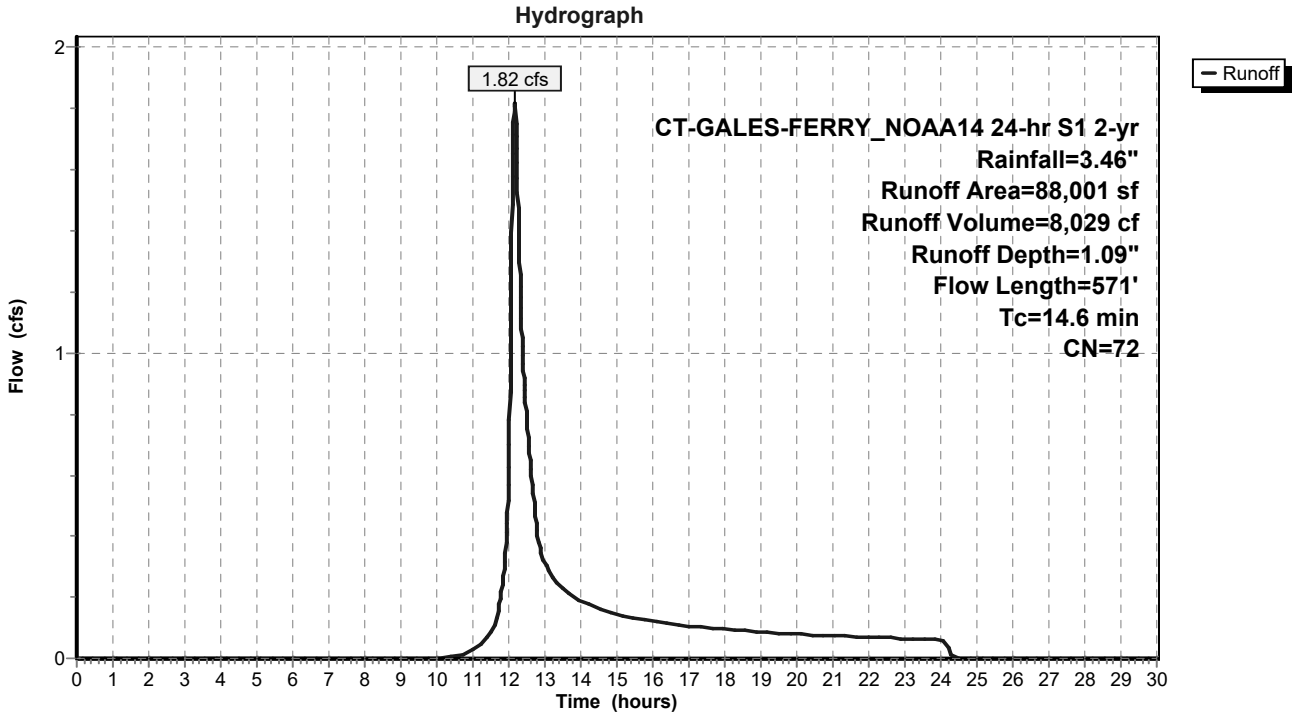
Runoff = 1.82 cfs @ 12.16 hrs, Volume= 8,029 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 2-yr Rainfall=3.46"

Area (sf)	CN	Description
36,710	60	Woods, Fair, HSG B
42,767	79	Woods, Fair, HSG D
2,700	61	>75% Grass cover, Good, HSG B
5,824	98	Paved parking, HSG B
88,001	72	Weighted Average
82,177		93.38% Pervious Area
5,824		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.2600	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.3	37	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.0	11	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	136	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	287	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	571	Total			

Subcatchment EDA-200: EDA-200

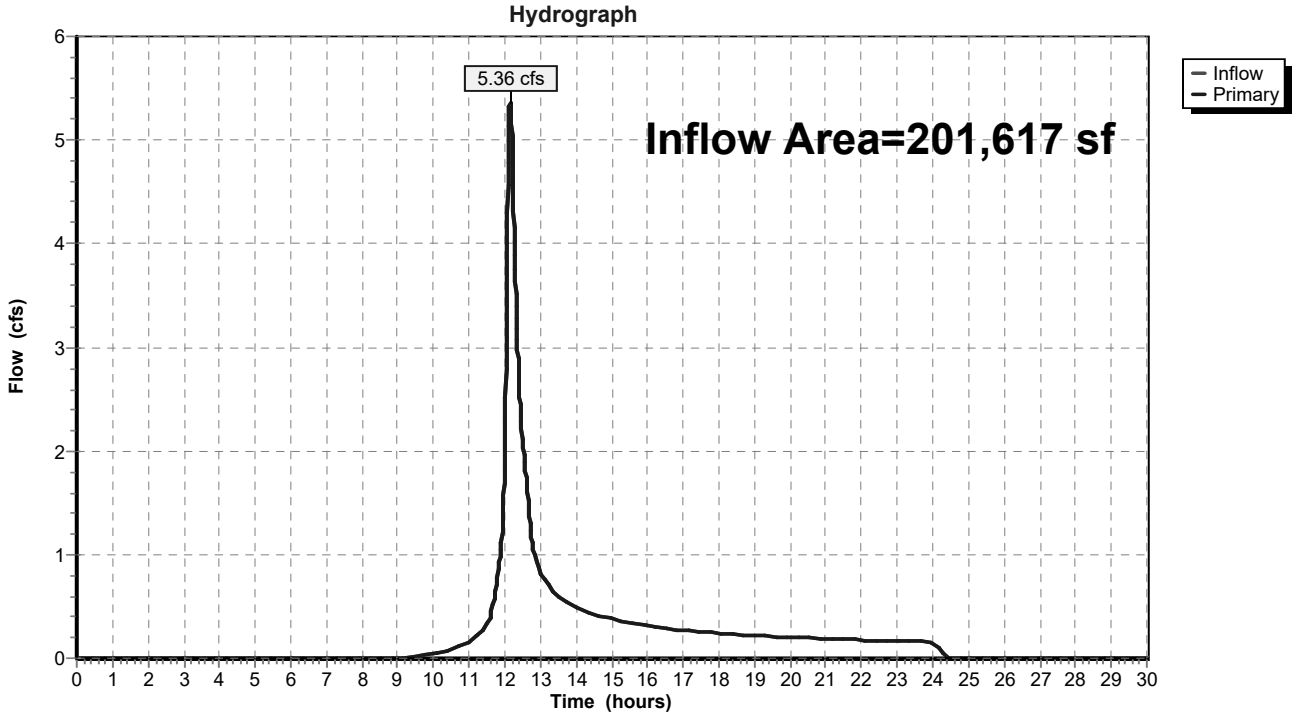


Summary for Link DP-1: DP-1

Inflow Area = 201,617 sf, 8.95% Impervious, Inflow Depth = 1.34" for 2-yr event
Inflow = 5.36 cfs @ 12.15 hrs, Volume= 22,453 cf
Primary = 5.36 cfs @ 12.15 hrs, Volume= 22,453 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

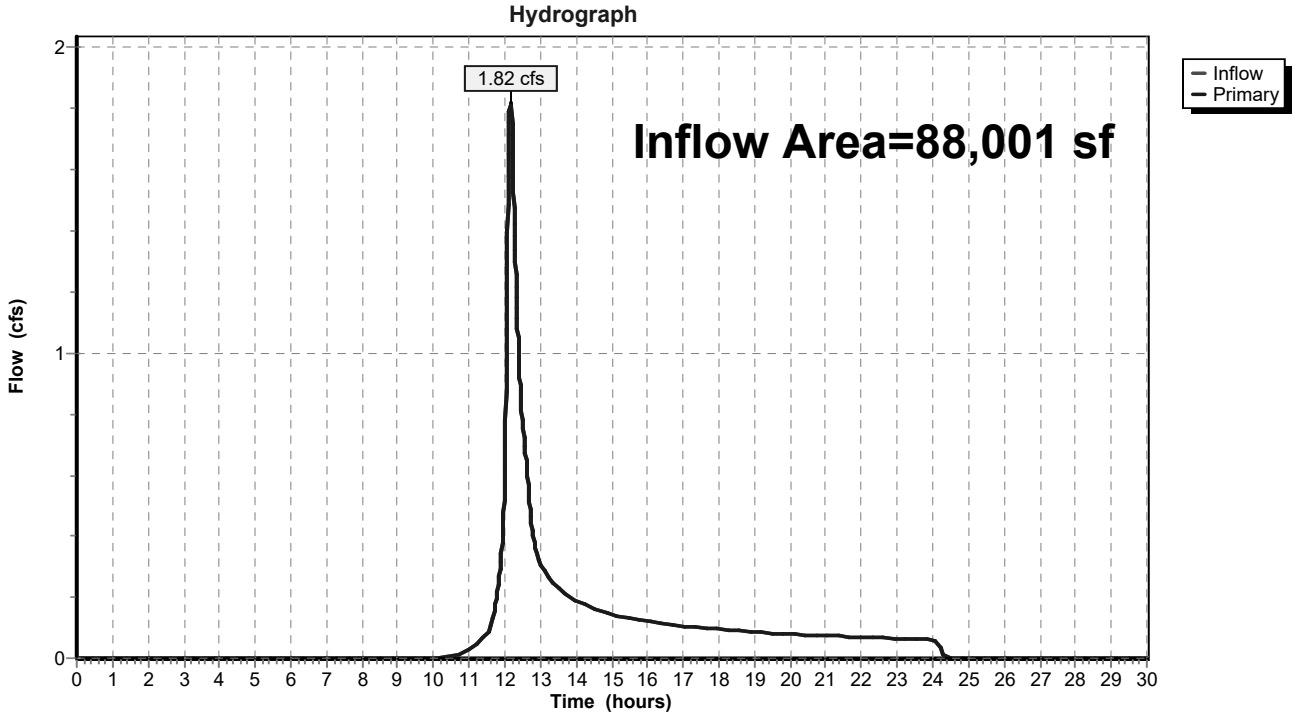


Summary for Link DP-2: DP-2

Inflow Area = 88,001 sf, 6.62% Impervious, Inflow Depth = 1.09" for 2-yr event
Inflow = 1.82 cfs @ 12.16 hrs, Volume= 8,029 cf
Primary = 1.82 cfs @ 12.16 hrs, Volume= 8,029 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-100: EDA-100 Runoff Area=201,617 sf 8.95% Impervious Runoff Depth=2.63"
Flow Length=443' Tc=14.3 min CN=76 Runoff=10.98 cfs 44,267 cf

Subcatchment EDA-200: EDA-200 Runoff Area=88,001 sf 6.62% Impervious Runoff Depth=2.29"
Flow Length=571' Tc=14.6 min CN=72 Runoff=4.09 cfs 16,799 cf

Link DP-1: DP-1 Inflow=10.98 cfs 44,267 cf
Primary=10.98 cfs 44,267 cf

Link DP-2: DP-2 Inflow=4.09 cfs 16,799 cf
Primary=4.09 cfs 16,799 cf

Total Runoff Area = 289,618 sf Runoff Volume = 61,066 cf Average Runoff Depth = 2.53"
91.76% Pervious = 265,759 sf 8.24% Impervious = 23,859 sf

Summary for Subcatchment EDA-100: EDA-100

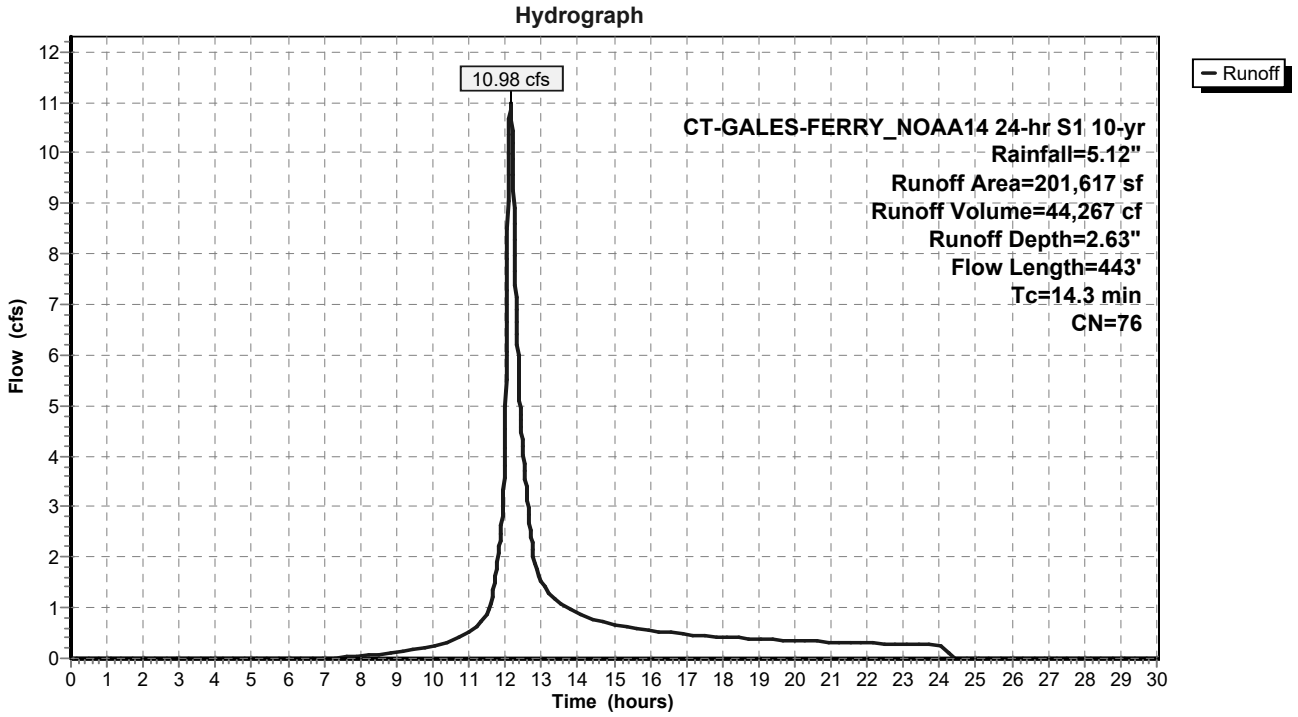
Runoff = 10.98 cfs @ 12.15 hrs, Volume= 44,267 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 10-yr Rainfall=5.12"

Area (sf)	CN	Description
39,441	60	Woods, Fair, HSG B
117,872	79	Woods, Fair, HSG D
15,868	61	>75% Grass cover, Good, HSG B
7,401	80	>75% Grass cover, Good, HSG D
7,261	98	Paved parking, HSG B
6,541	98	Paved parking, HSG D
152	96	Gravel surface, HSG B
2,848	96	Gravel surface, HSG D
1,914	98	Roofs, HSG B
2,319	98	Roofs, HSG D
201,617	76	Weighted Average
183,582		91.05% Pervious Area
18,035		8.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.2	42	0.4000	3.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	182	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	98	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.3	443	Total			

Subcatchment EDA-100: EDA-100



Summary for Subcatchment EDA-200: EDA-200

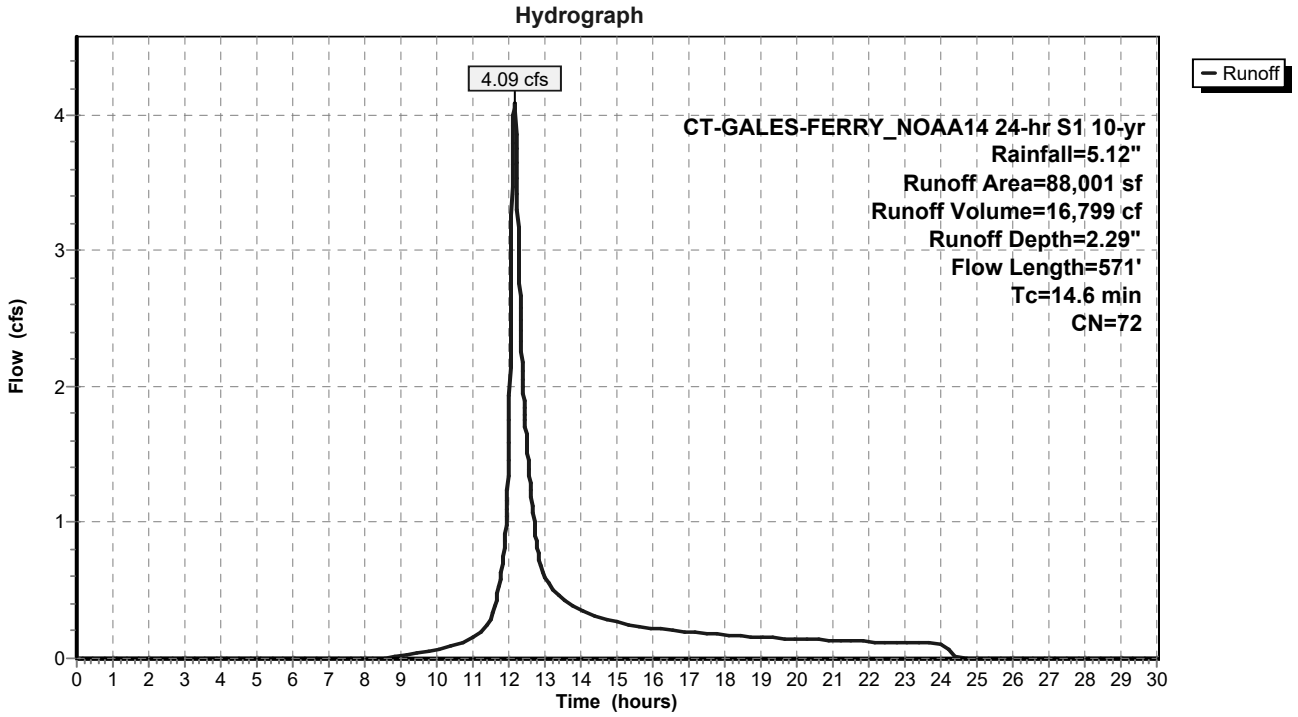
Runoff = 4.09 cfs @ 12.15 hrs, Volume= 16,799 cf, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 10-yr Rainfall=5.12"

Area (sf)	CN	Description
36,710	60	Woods, Fair, HSG B
42,767	79	Woods, Fair, HSG D
2,700	61	>75% Grass cover, Good, HSG B
5,824	98	Paved parking, HSG B
88,001	72	Weighted Average
82,177		93.38% Pervious Area
5,824		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.2600	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.3	37	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.0	11	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	136	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	287	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	571	Total			

Subcatchment EDA-200: EDA-200

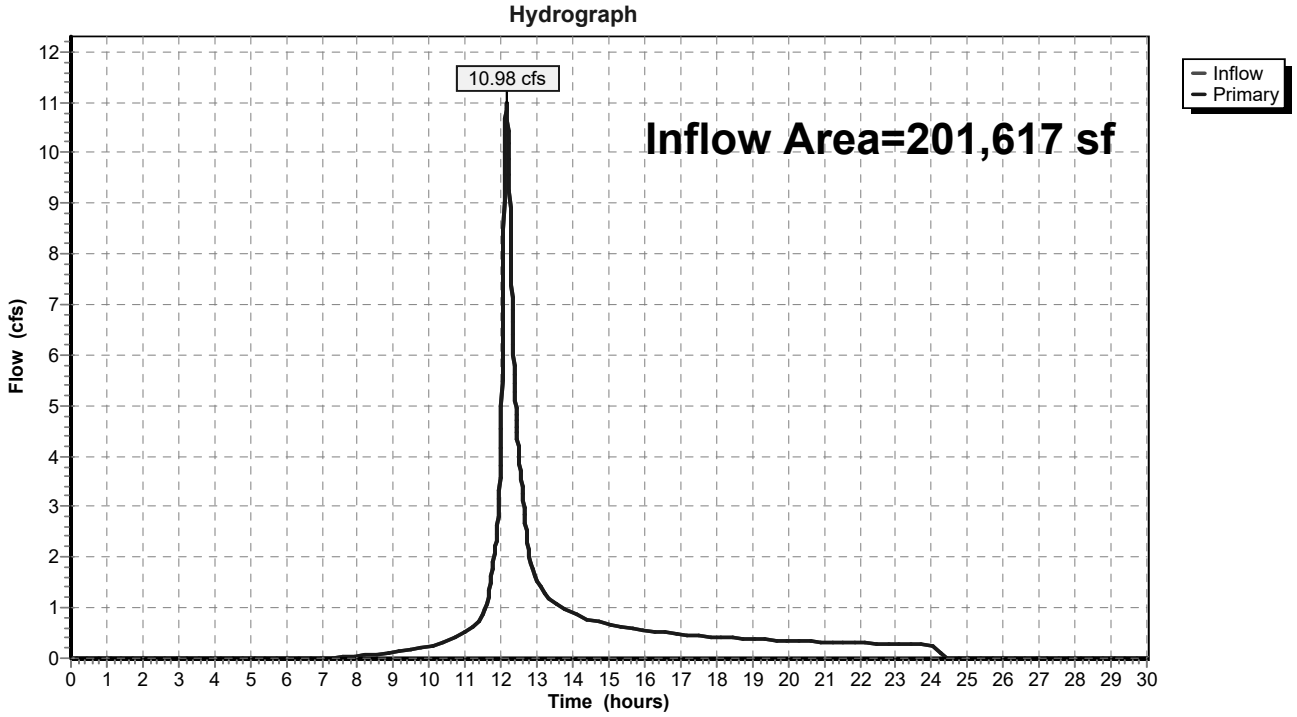


Summary for Link DP-1: DP-1

Inflow Area = 201,617 sf, 8.95% Impervious, Inflow Depth = 2.63" for 10-yr event
Inflow = 10.98 cfs @ 12.15 hrs, Volume= 44,267 cf
Primary = 10.98 cfs @ 12.15 hrs, Volume= 44,267 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

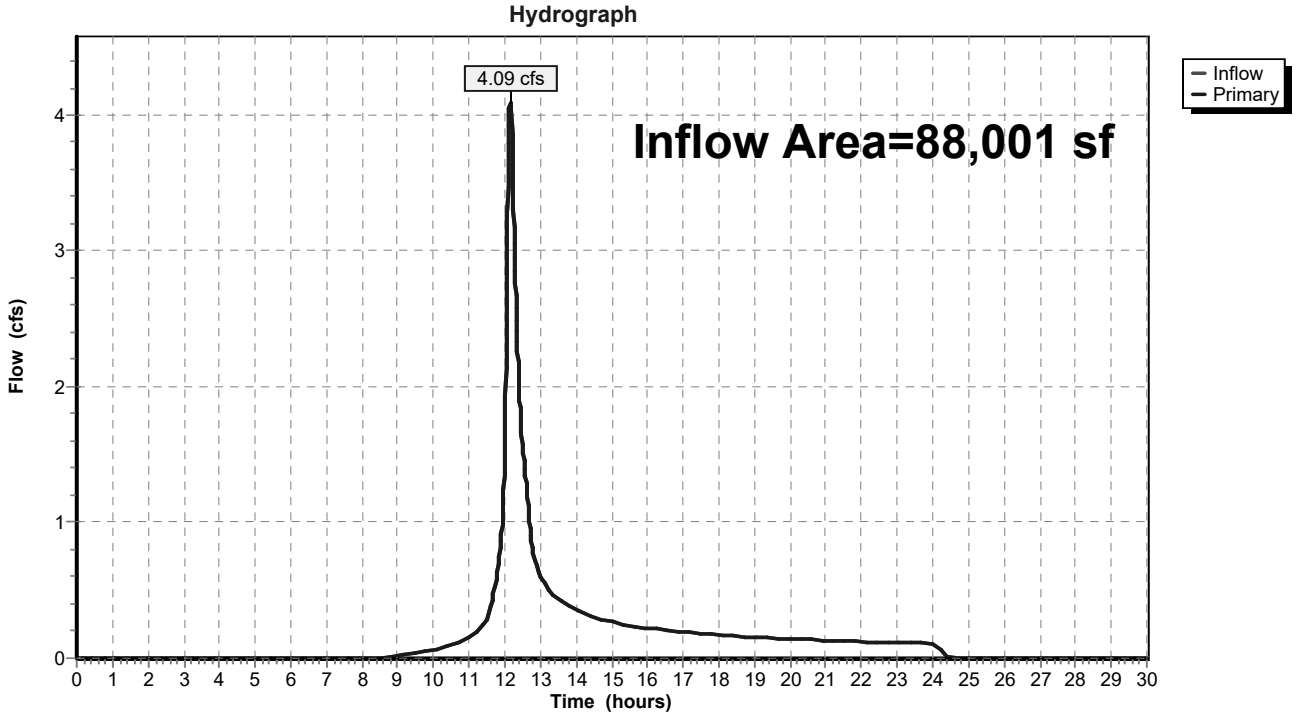


Summary for Link DP-2: DP-2

Inflow Area = 88,001 sf, 6.62% Impervious, Inflow Depth = 2.29" for 10-yr event
Inflow = 4.09 cfs @ 12.15 hrs, Volume= 16,799 cf
Primary = 4.09 cfs @ 12.15 hrs, Volume= 16,799 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-100: EDA-100 Runoff Area=201,617 sf 8.95% Impervious Runoff Depth=3.51"
Flow Length=443' Tc=14.3 min CN=76 Runoff=14.71 cfs 58,971 cf

Subcatchment EDA-200: EDA-200 Runoff Area=88,001 sf 6.62% Impervious Runoff Depth=3.12"
Flow Length=571' Tc=14.6 min CN=72 Runoff=5.63 cfs 22,853 cf

Link DP-1: DP-1 Inflow=14.71 cfs 58,971 cf
Primary=14.71 cfs 58,971 cf

Link DP-2: DP-2 Inflow=5.63 cfs 22,853 cf
Primary=5.63 cfs 22,853 cf

Total Runoff Area = 289,618 sf Runoff Volume = 81,825 cf Average Runoff Depth = 3.39"
91.76% Pervious = 265,759 sf 8.24% Impervious = 23,859 sf

Summary for Subcatchment EDA-100: EDA-100

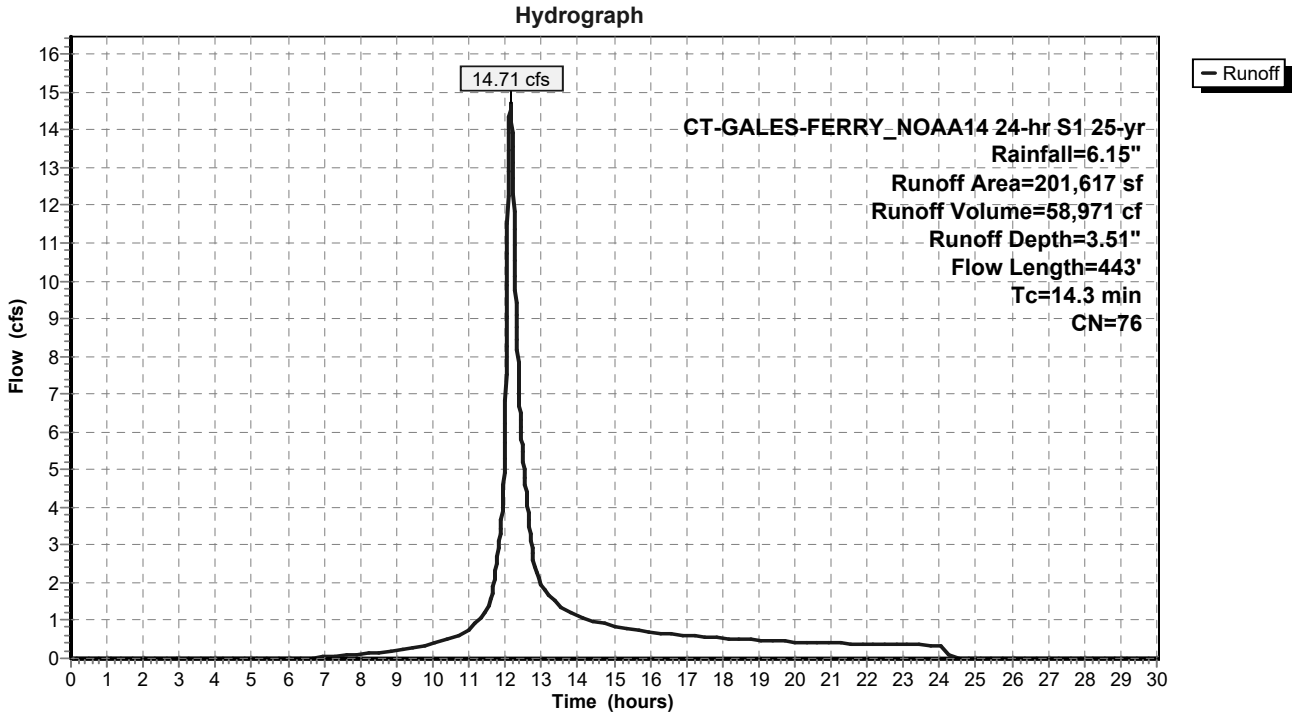
Runoff = 14.71 cfs @ 12.15 hrs, Volume= 58,971 cf, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 25-yr Rainfall=6.15"

Area (sf)	CN	Description
39,441	60	Woods, Fair, HSG B
117,872	79	Woods, Fair, HSG D
15,868	61	>75% Grass cover, Good, HSG B
7,401	80	>75% Grass cover, Good, HSG D
7,261	98	Paved parking, HSG B
6,541	98	Paved parking, HSG D
152	96	Gravel surface, HSG B
2,848	96	Gravel surface, HSG D
1,914	98	Roofs, HSG B
2,319	98	Roofs, HSG D
201,617	76	Weighted Average
183,582		91.05% Pervious Area
18,035		8.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.2	42	0.4000	3.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	182	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	98	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.3	443	Total			

Subcatchment EDA-100: EDA-100



Summary for Subcatchment EDA-200: EDA-200

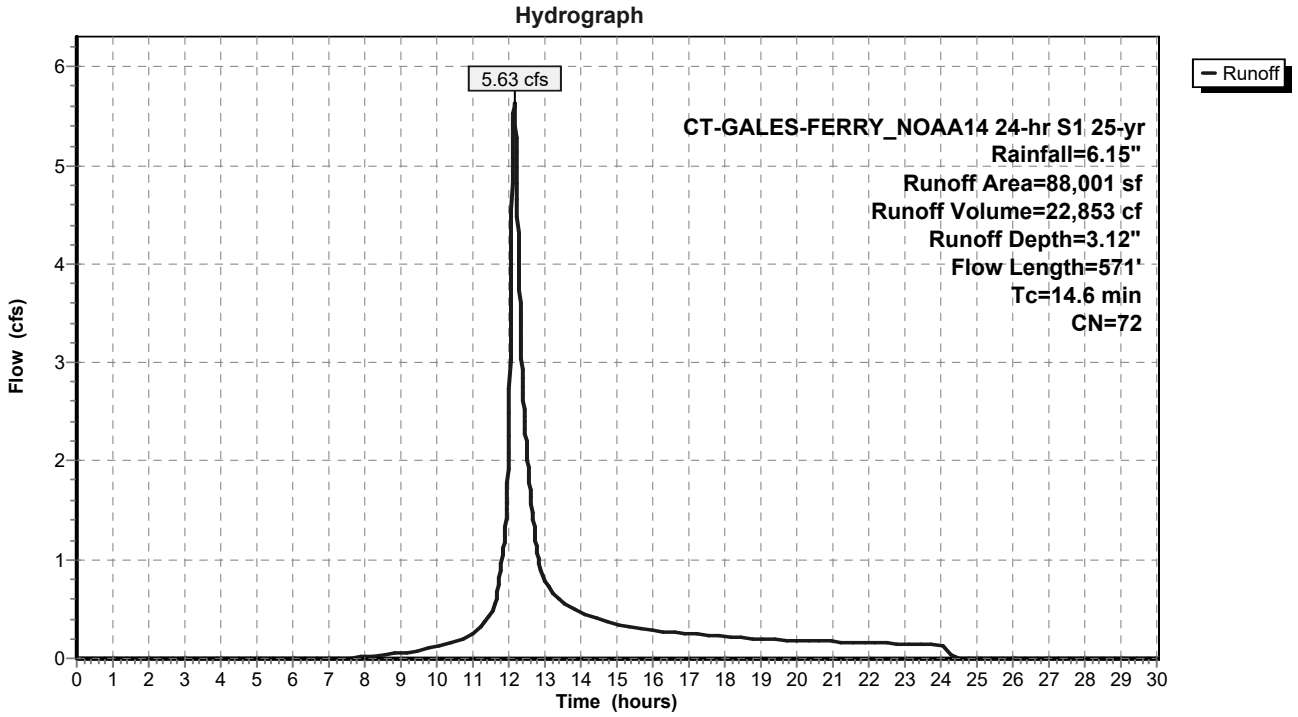
Runoff = 5.63 cfs @ 12.15 hrs, Volume= 22,853 cf, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 25-yr Rainfall=6.15"

Area (sf)	CN	Description
36,710	60	Woods, Fair, HSG B
42,767	79	Woods, Fair, HSG D
2,700	61	>75% Grass cover, Good, HSG B
5,824	98	Paved parking, HSG B
88,001	72	Weighted Average
82,177		93.38% Pervious Area
5,824		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.2600	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.3	37	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.0	11	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	136	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	287	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	571	Total			

Subcatchment EDA-200: EDA-200

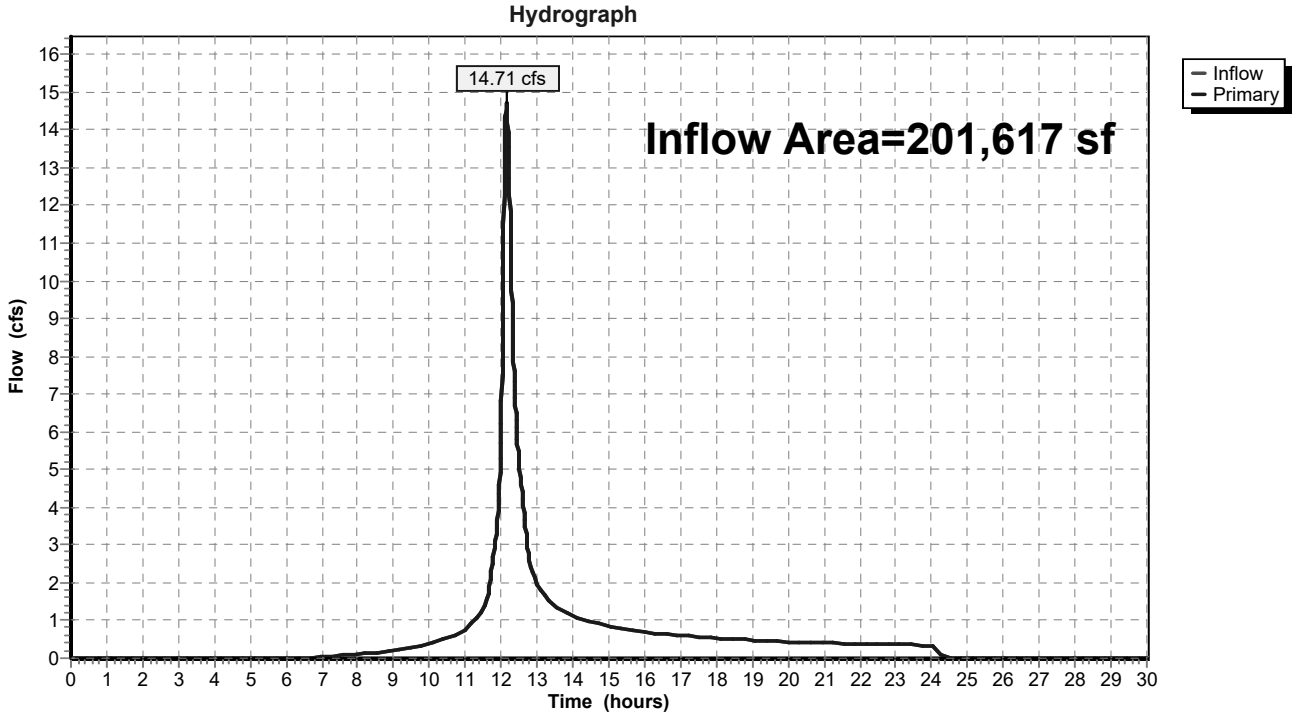


Summary for Link DP-1: DP-1

Inflow Area = 201,617 sf, 8.95% Impervious, Inflow Depth = 3.51" for 25-yr event
Inflow = 14.71 cfs @ 12.15 hrs, Volume= 58,971 cf
Primary = 14.71 cfs @ 12.15 hrs, Volume= 58,971 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

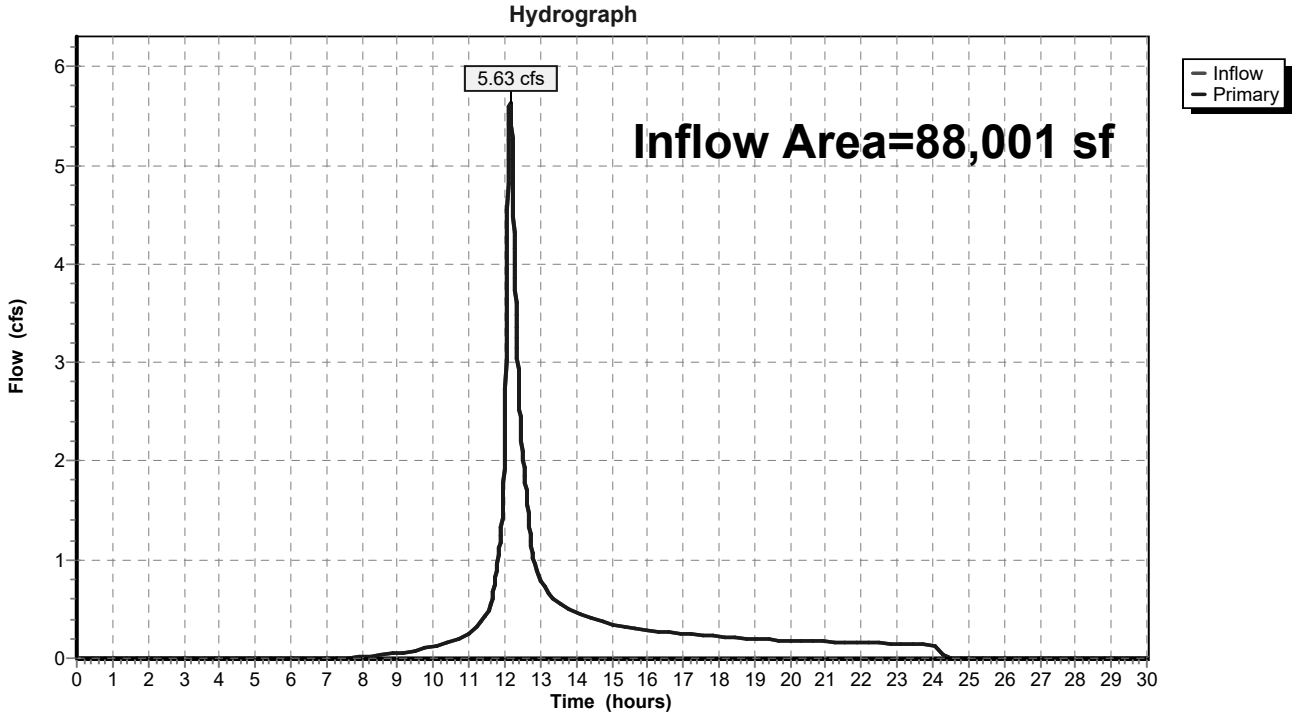


Summary for Link DP-2: DP-2

Inflow Area = 88,001 sf, 6.62% Impervious, Inflow Depth = 3.12" for 25-yr event
Inflow = 5.63 cfs @ 12.15 hrs, Volume= 22,853 cf
Primary = 5.63 cfs @ 12.15 hrs, Volume= 22,853 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-100: EDA-100 Runoff Area=201,617 sf 8.95% Impervious Runoff Depth=4.93"
Flow Length=443' Tc=14.3 min CN=76 Runoff=20.68 cfs 82,847 cf

Subcatchment EDA-200: EDA-200 Runoff Area=88,001 sf 6.62% Impervious Runoff Depth=4.48"
Flow Length=571' Tc=14.6 min CN=72 Runoff=8.15 cfs 32,823 cf

Link DP-1: DP-1 Inflow=20.68 cfs 82,847 cf
Primary=20.68 cfs 82,847 cf

Link DP-2: DP-2 Inflow=8.15 cfs 32,823 cf
Primary=8.15 cfs 32,823 cf

Total Runoff Area = 289,618 sf Runoff Volume = 115,670 cf Average Runoff Depth = 4.79"
91.76% Pervious = 265,759 sf 8.24% Impervious = 23,859 sf

Summary for Subcatchment EDA-100: EDA-100

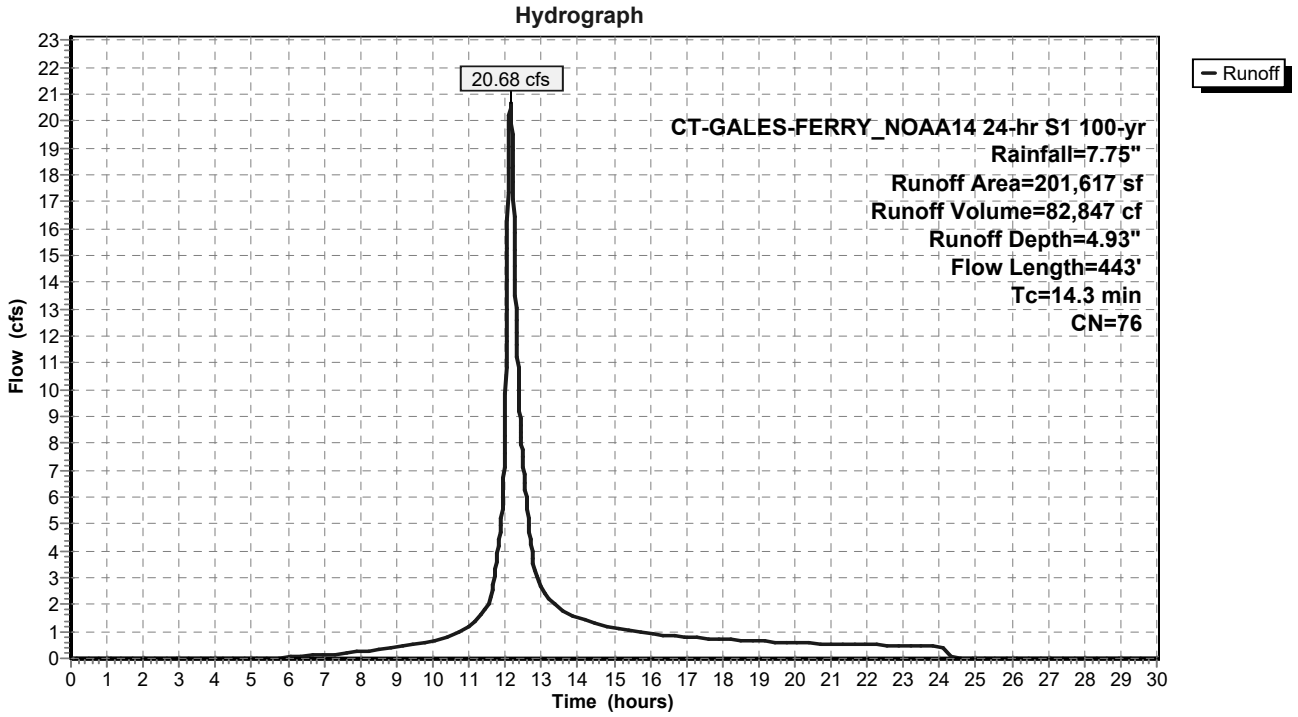
Runoff = 20.68 cfs @ 12.15 hrs, Volume= 82,847 cf, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 100-yr Rainfall=7.75"

Area (sf)	CN	Description
39,441	60	Woods, Fair, HSG B
117,872	79	Woods, Fair, HSG D
15,868	61	>75% Grass cover, Good, HSG B
7,401	80	>75% Grass cover, Good, HSG D
7,261	98	Paved parking, HSG B
6,541	98	Paved parking, HSG D
152	96	Gravel surface, HSG B
2,848	96	Gravel surface, HSG D
1,914	98	Roofs, HSG B
2,319	98	Roofs, HSG D
201,617	76	Weighted Average
183,582		91.05% Pervious Area
18,035		8.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.2	42	0.4000	3.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	182	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	98	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.3	443	Total			

Subcatchment EDA-100: EDA-100



Summary for Subcatchment EDA-200: EDA-200

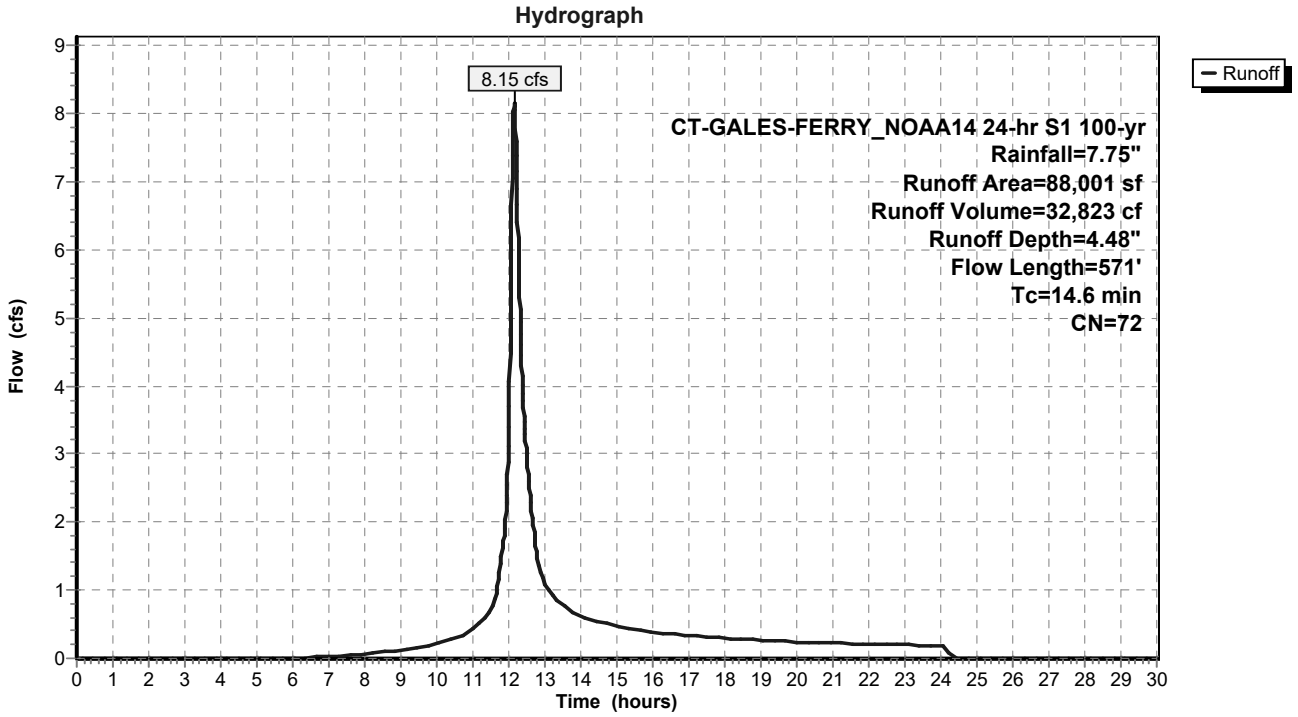
Runoff = 8.15 cfs @ 12.15 hrs, Volume= 32,823 cf, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 100-yr Rainfall=7.75"

Area (sf)	CN	Description
36,710	60	Woods, Fair, HSG B
42,767	79	Woods, Fair, HSG D
2,700	61	>75% Grass cover, Good, HSG B
5,824	98	Paved parking, HSG B
88,001	72	Weighted Average
82,177		93.38% Pervious Area
5,824		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.2600	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.3	37	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.0	11	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.7	136	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	287	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.6	571	Total			

Subcatchment EDA-200: EDA-200

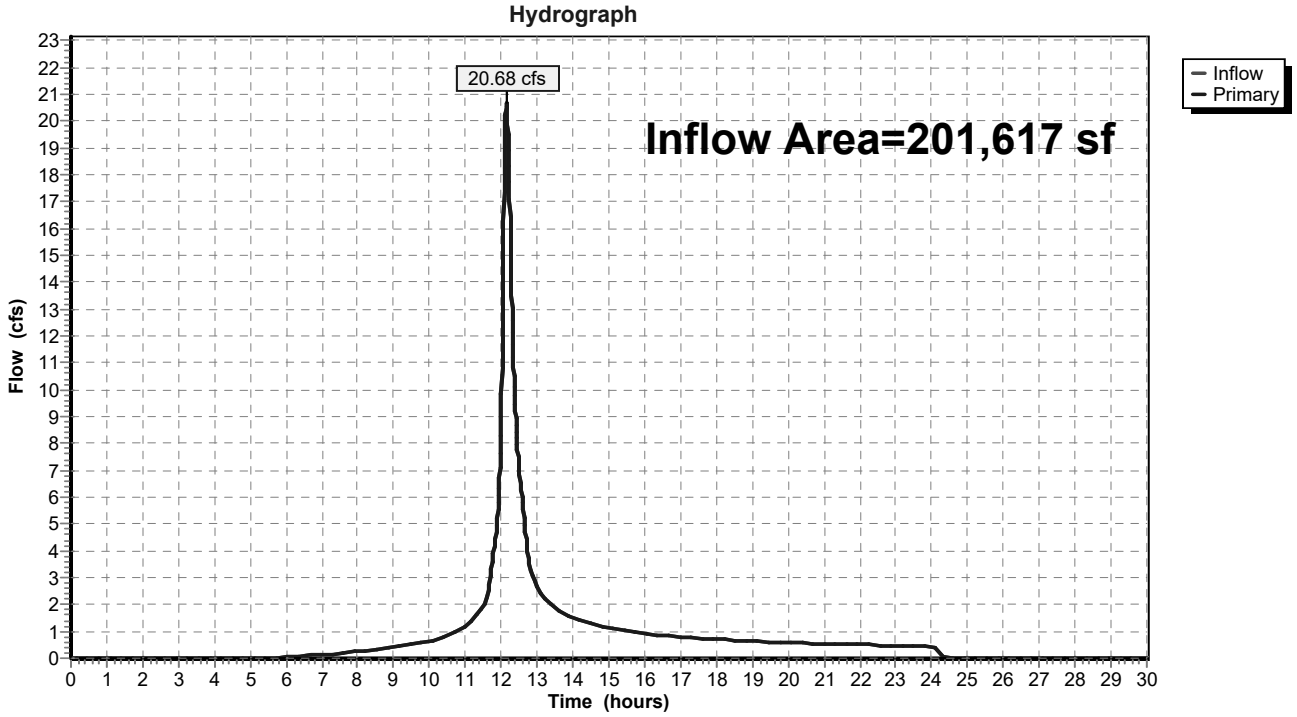


Summary for Link DP-1: DP-1

Inflow Area = 201,617 sf, 8.95% Impervious, Inflow Depth = 4.93" for 100-yr event
Inflow = 20.68 cfs @ 12.15 hrs, Volume= 82,847 cf
Primary = 20.68 cfs @ 12.15 hrs, Volume= 82,847 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

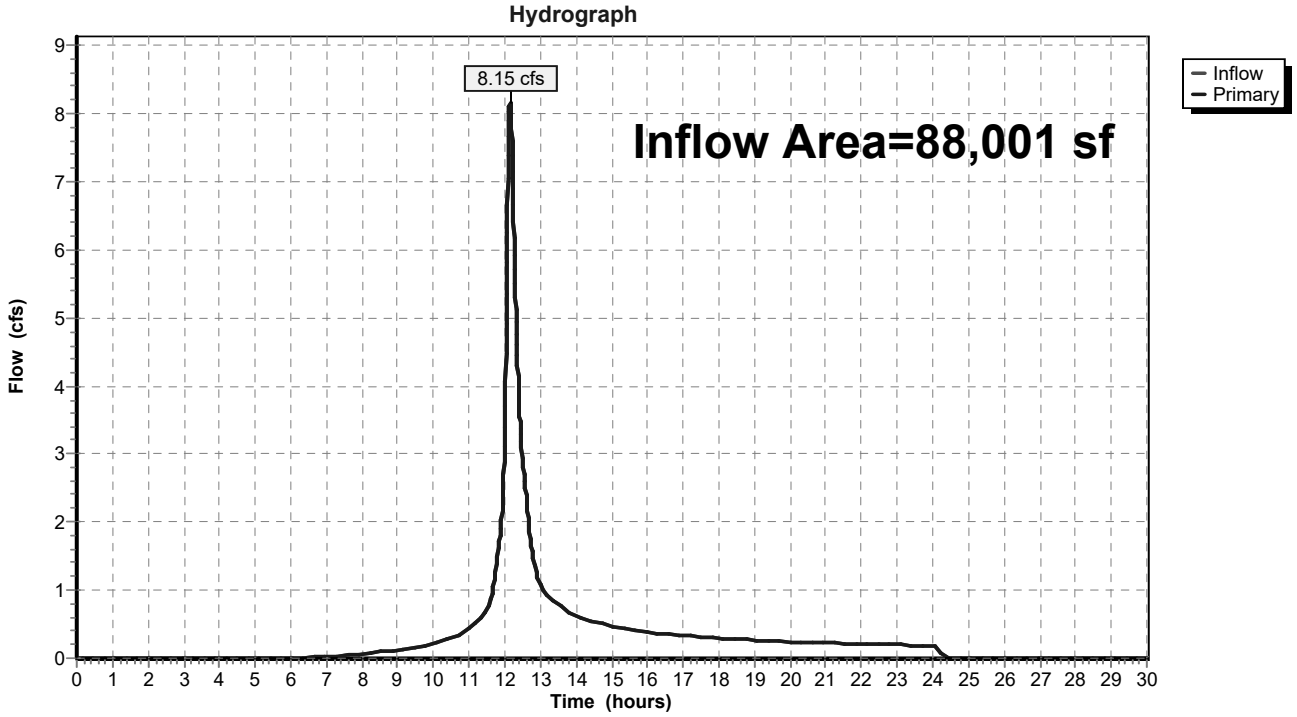


Summary for Link DP-2: DP-2

Inflow Area = 88,001 sf, 6.62% Impervious, Inflow Depth = 4.48" for 100-yr event
Inflow = 8.15 cfs @ 12.15 hrs, Volume= 32,823 cf
Primary = 8.15 cfs @ 12.15 hrs, Volume= 32,823 cf, Atten= 0%, Lag= 0.0 min

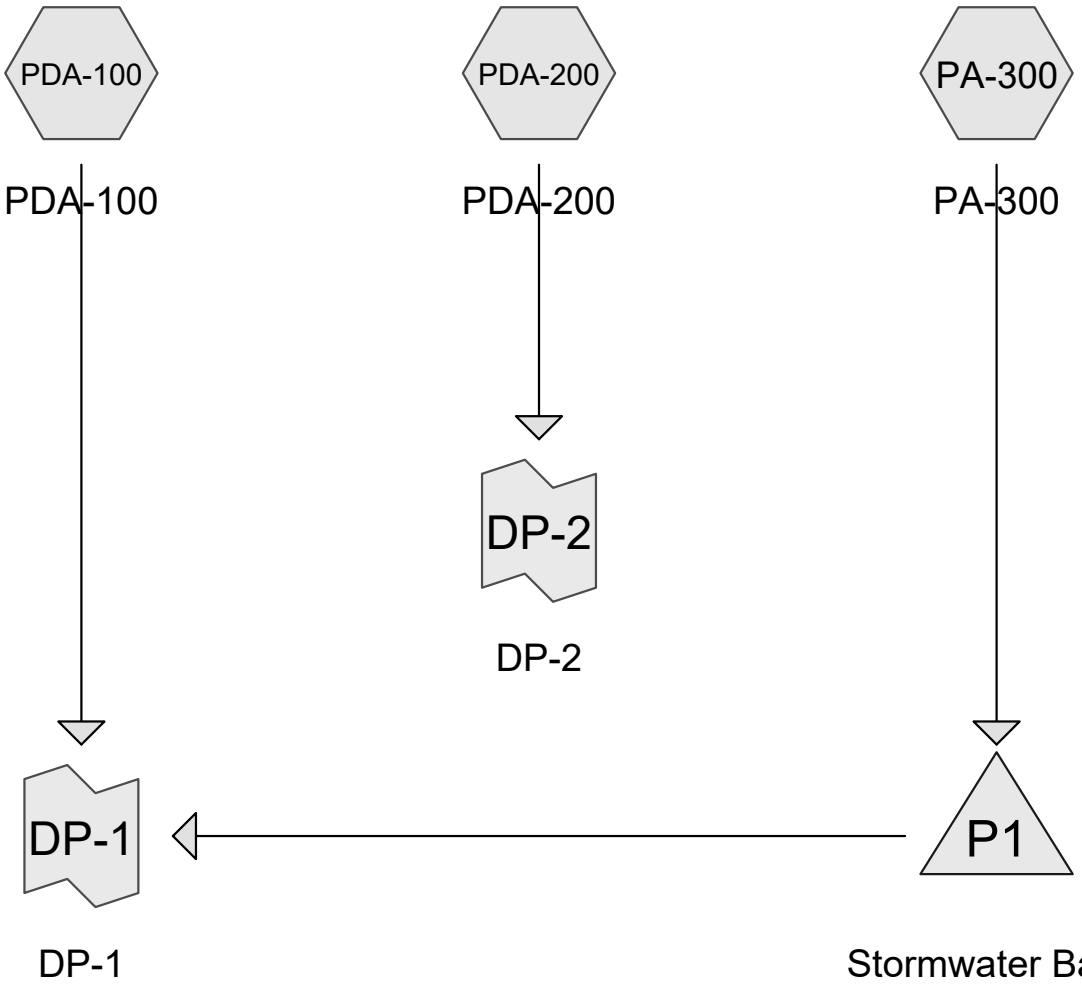
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



APPENDIX C

Proposed Conditions Hydrology
(2-, 10-, 25-, and 100-year storms)



Subcat Reach Pond Link

Routing Diagram for C-DAT-2102412-PROP HYDRO
Prepared by BL Companies, Printed 7/17/2022

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PA-300: PA-300 Runoff Area=139,303 sf 24.31% Impervious Runoff Depth=1.75"
Flow Length=423' Tc=12.8 min CN=82 Runoff=5.31 cfs 20,311 cf

Subcatchment PDA-100: PDA-100 Runoff Area=124,577 sf 21.80% Impervious Runoff Depth=1.60"
Flow Length=673' Tc=19.1 min CN=80 Runoff=3.53 cfs 16,659 cf

Subcatchment PDA-200: PDA-200 Runoff Area=25,738 sf 25.99% Impervious Runoff Depth=1.04"
Flow Length=183' Tc=8.7 min CN=71 Runoff=0.63 cfs 2,227 cf

Pond P1: Stormwater Basin Peak Elev=52.39' Storage=14,769 cf Inflow=5.31 cfs 20,311 cf
Discarded=0.12 cfs 8,012 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 8,012 cf

Link DP-1: DP-1 Inflow=3.53 cfs 16,659 cf
Primary=3.53 cfs 16,659 cf

Link DP-2: DP-2 Inflow=0.63 cfs 2,227 cf
Primary=0.63 cfs 2,227 cf

Total Runoff Area = 289,618 sf Runoff Volume = 39,197 cf Average Runoff Depth = 1.62"
76.62% Pervious = 221,908 sf 23.38% Impervious = 67,710 sf

Summary for Subcatchment PA-300: PA-300

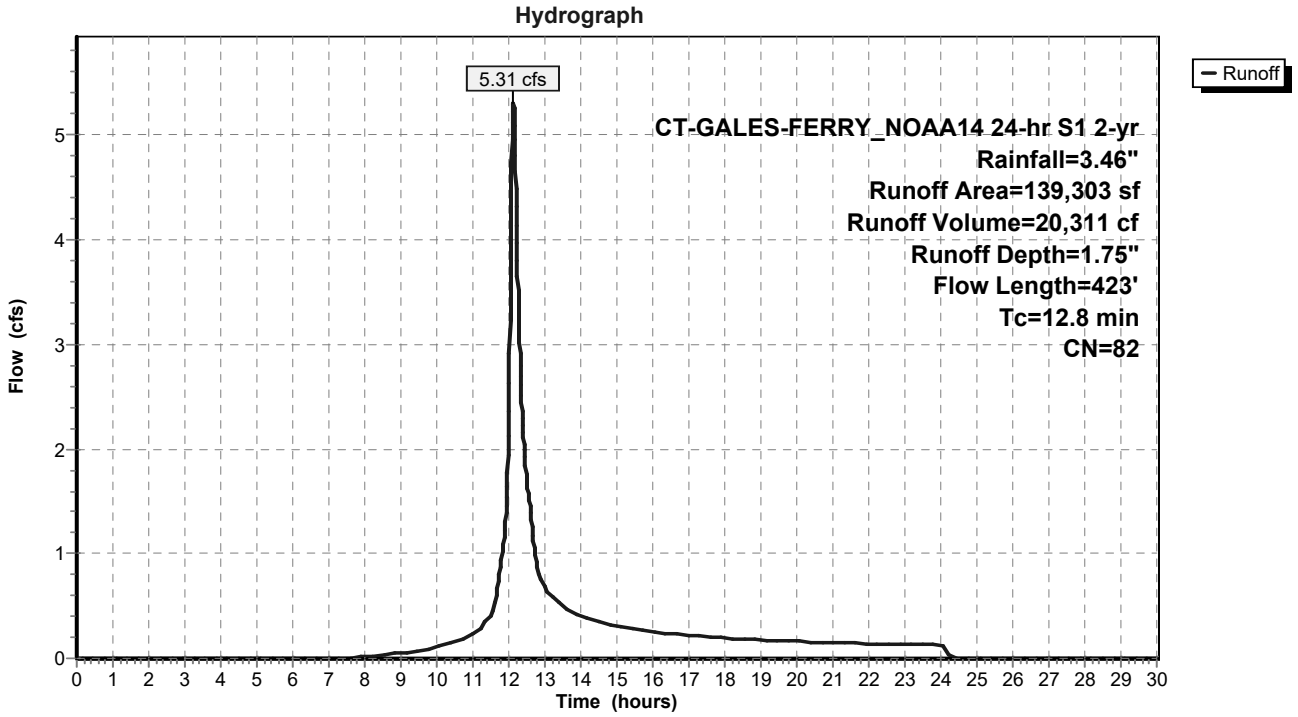
Runoff = 5.31 cfs @ 12.13 hrs, Volume= 20,311 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 2-yr Rainfall=3.46"

Area (sf)	CN	Description
627	60	Woods, Fair, HSG B
60,165	79	Woods, Fair, HSG D
15,389	61	>75% Grass cover, Good, HSG B
29,260	80	>75% Grass cover, Good, HSG D
21,042	98	Paved parking, HSG B
3,051	98	Paved parking, HSG D
2,319	98	Roofs, HSG B
7,450	98	Water Surface, HSG D
139,303	82	Weighted Average
105,441		75.69% Pervious Area
33,862		24.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	31	0.0922	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
3.6	48	0.3621	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
1.3	21	0.9076	0.27		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.1	24	0.4338	3.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	18	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	48	0.1877	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	98	0.0131	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	13	0.3945	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.0169	2.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	79	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.8	423	Total			

Subcatchment PA-300: PA-300



Summary for Subcatchment PDA-100: PDA-100

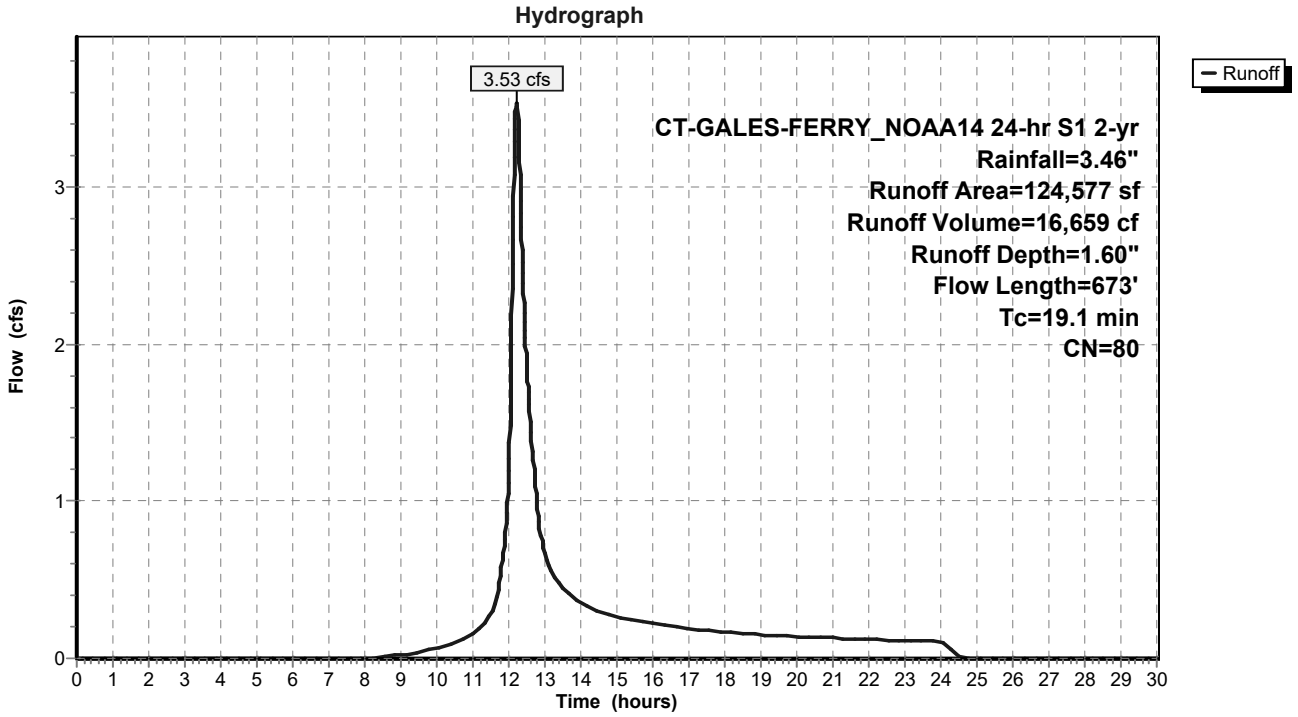
Runoff = 3.53 cfs @ 12.22 hrs, Volume= 16,659 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 2-yr Rainfall=3.46"

Area (sf)	CN	Description
5,812	60	Woods, Fair, HSG B
60,628	79	Woods, Fair, HSG D
21,174	61	>75% Grass cover, Good, HSG B
6,833	80	>75% Grass cover, Good, HSG D
9,925	98	Paved parking, HSG B
6,539	98	Paved parking, HSG D
150	96	Gravel surface, HSG B
2,821	96	Gravel surface, HSG D
10,695	98	Roofs, HSG B
124,577	80	Weighted Average
97,418		78.20% Pervious Area
27,159		21.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	70	0.0528	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.8	30	0.2648	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.4	68	0.3617	3.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	36	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.7	331	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	25	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	66	0.0666	5.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0426	4.19		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.1	673	Total			

Subcatchment PDA-100: PDA-100



Summary for Subcatchment PDA-200: PDA-200

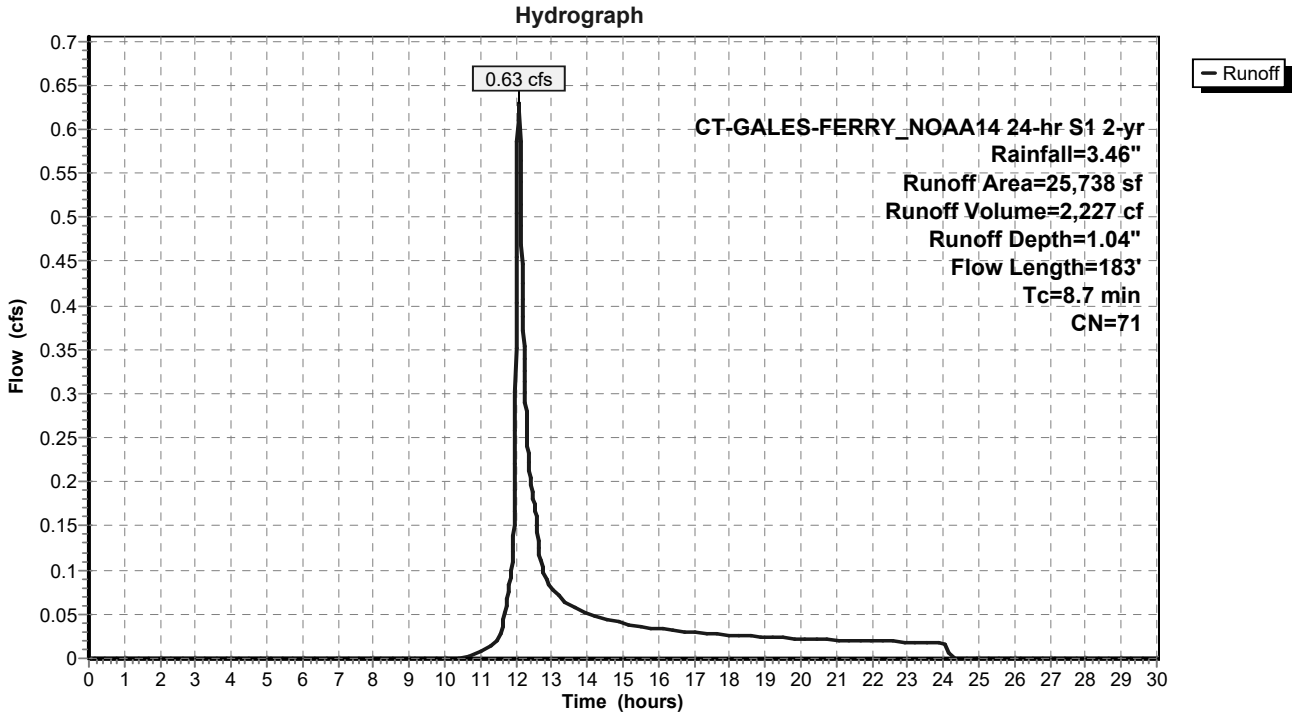
Runoff = 0.63 cfs @ 12.08 hrs, Volume= 2,227 cf, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 2-yr Rainfall=3.46"

Area (sf)	CN	Description
2,265	60	Woods, Fair, HSG B
598	79	Woods, Fair, HSG D
16,063	61	>75% Grass cover, Good, HSG B
123	80	>75% Grass cover, Good, HSG D
6,689	98	Paved parking, HSG B
25,738	71	Weighted Average
19,049		74.01% Pervious Area
6,689		25.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	10	0.0953	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.8	19	0.3100	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
1.0	13	0.0821	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
4.9	58	0.0341	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.3	25	0.0341	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	58	0.0261	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.7	183	Total			

Subcatchment PDA-200: PDA-200



Summary for Pond P1: Stormwater Basin

Inflow Area = 139,303 sf, 24.31% Impervious, Inflow Depth = 1.75" for 2-yr event
Inflow = 5.31 cfs @ 12.13 hrs, Volume= 20,311 cf
Outflow = 0.12 cfs @ 23.95 hrs, Volume= 8,012 cf, Atten= 98%, Lag= 709.5 min
Discarded = 0.12 cfs @ 23.95 hrs, Volume= 8,012 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 52.39' @ 23.95 hrs Surf.Area= 5,299 sf Storage= 14,769 cf

Plug-Flow detention time= 533.0 min calculated for 8,012 cf (39% of inflow)
Center-of-Mass det. time= 379.2 min (1,238.8 - 859.6)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	32,030 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

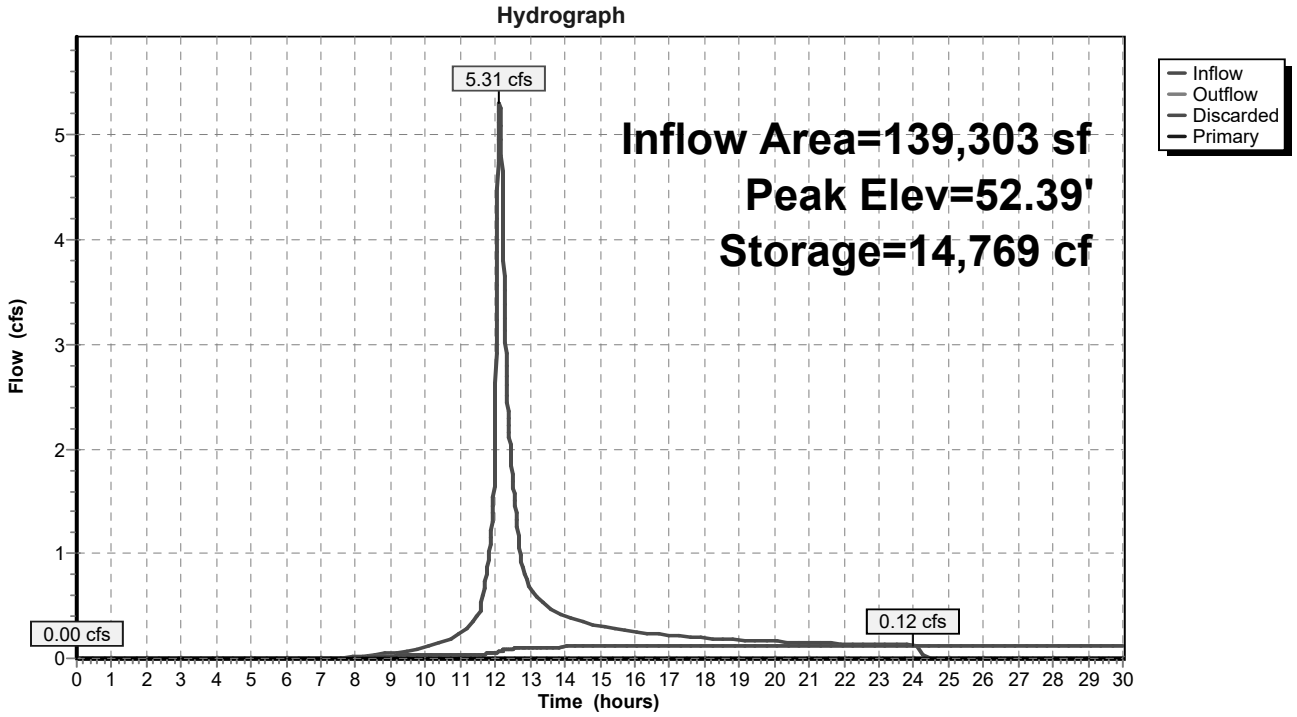
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	1,605	0	0
49.00	2,349	1,977	1,977
50.00	3,150	2,750	4,727
51.00	4,006	3,578	8,305
52.00	4,919	4,463	12,767
53.00	5,889	5,404	18,171
54.00	6,915	6,402	24,573
55.00	7,998	7,457	32,030

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**0.720 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'
#2	Primary	52.08'	**18.0" Round Culvert** L= 147.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 52.08' / 51.44' S= 0.0044 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	52.50'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.12 cfs @ 23.95 hrs HW=52.39' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.00' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Stormwater Basin

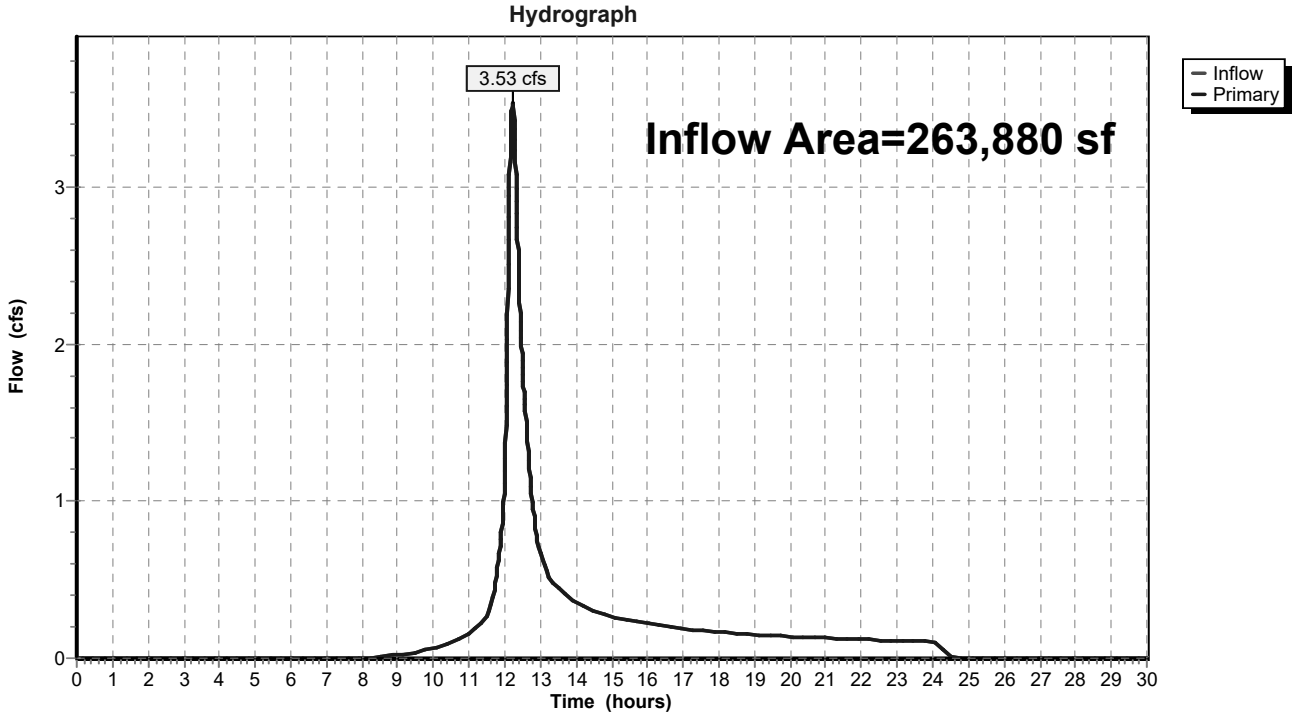


Summary for Link DP-1: DP-1

Inflow Area = 263,880 sf, 23.12% Impervious, Inflow Depth = 0.76" for 2-yr event
Inflow = 3.53 cfs @ 12.22 hrs, Volume= 16,659 cf
Primary = 3.53 cfs @ 12.22 hrs, Volume= 16,659 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

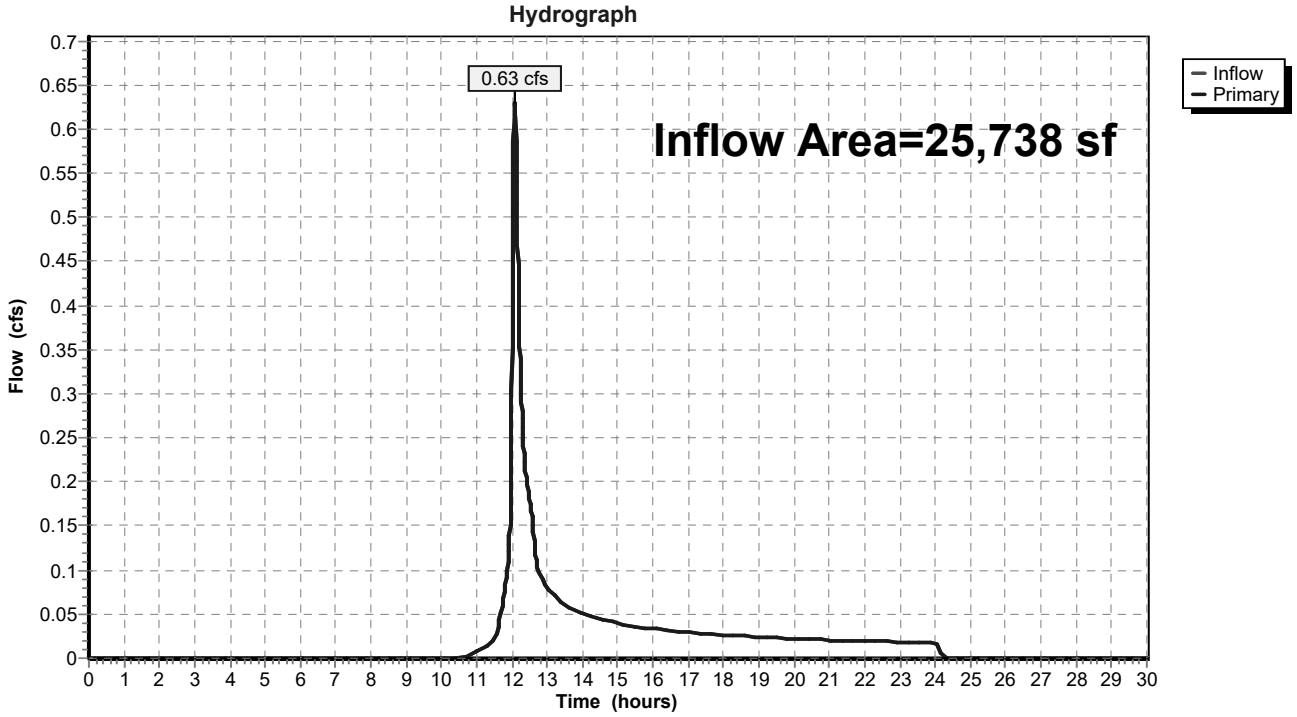


Summary for Link DP-2: DP-2

Inflow Area = 25,738 sf, 25.99% Impervious, Inflow Depth = 1.04" for 2-yr event
Inflow = 0.63 cfs @ 12.08 hrs, Volume= 2,227 cf
Primary = 0.63 cfs @ 12.08 hrs, Volume= 2,227 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PA-300: PA-300 Runoff Area=139,303 sf 24.31% Impervious Runoff Depth=3.19"
Flow Length=423' Tc=12.8 min CN=82 Runoff=9.75 cfs 36,992 cf

Subcatchment PDA-100: PDA-100 Runoff Area=124,577 sf 21.80% Impervious Runoff Depth=3.00"
Flow Length=673' Tc=19.1 min CN=80 Runoff=6.72 cfs 31,122 cf

Subcatchment PDA-200: PDA-200 Runoff Area=25,738 sf 25.99% Impervious Runoff Depth=2.21"
Flow Length=183' Tc=8.7 min CN=71 Runoff=1.45 cfs 4,735 cf

Pond P1: Stormwater Basin Peak Elev=52.86' Storage=17,338 cf Inflow=9.75 cfs 36,992 cf
Discarded=0.14 cfs 9,009 cf Primary=2.06 cfs 15,042 cf Outflow=2.20 cfs 24,051 cf

Link DP-1: DP-1 Inflow=6.72 cfs 46,164 cf
Primary=6.72 cfs 46,164 cf

Link DP-2: DP-2 Inflow=1.45 cfs 4,735 cf
Primary=1.45 cfs 4,735 cf

Total Runoff Area = 289,618 sf Runoff Volume = 72,849 cf Average Runoff Depth = 3.02"
76.62% Pervious = 221,908 sf 23.38% Impervious = 67,710 sf

Summary for Subcatchment PA-300: PA-300

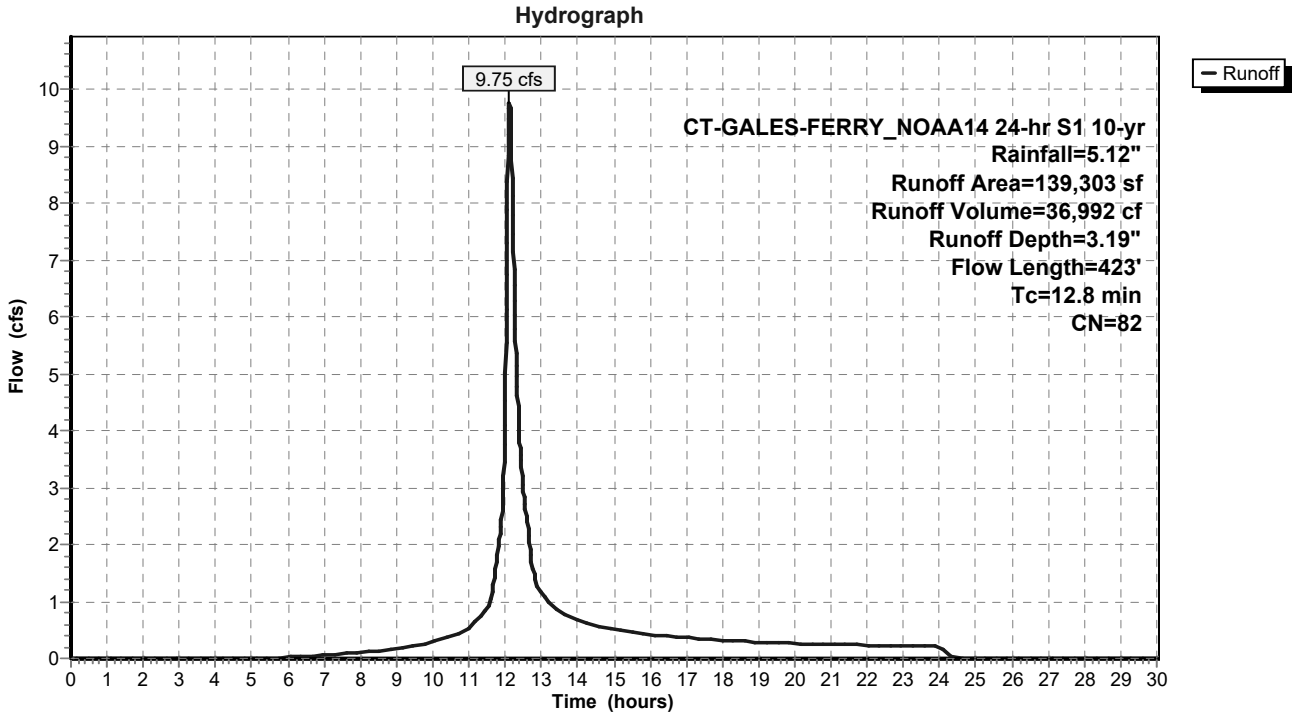
Runoff = 9.75 cfs @ 12.13 hrs, Volume= 36,992 cf, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 10-yr Rainfall=5.12"

Area (sf)	CN	Description
627	60	Woods, Fair, HSG B
60,165	79	Woods, Fair, HSG D
15,389	61	>75% Grass cover, Good, HSG B
29,260	80	>75% Grass cover, Good, HSG D
21,042	98	Paved parking, HSG B
3,051	98	Paved parking, HSG D
2,319	98	Roofs, HSG B
7,450	98	Water Surface, HSG D
139,303	82	Weighted Average
105,441		75.69% Pervious Area
33,862		24.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	31	0.0922	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
3.6	48	0.3621	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
1.3	21	0.9076	0.27		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.1	24	0.4338	3.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	18	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	48	0.1877	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	98	0.0131	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	13	0.3945	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.0169	2.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	79	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.8	423	Total			

Subcatchment PA-300: PA-300



Summary for Subcatchment PDA-100: PDA-100

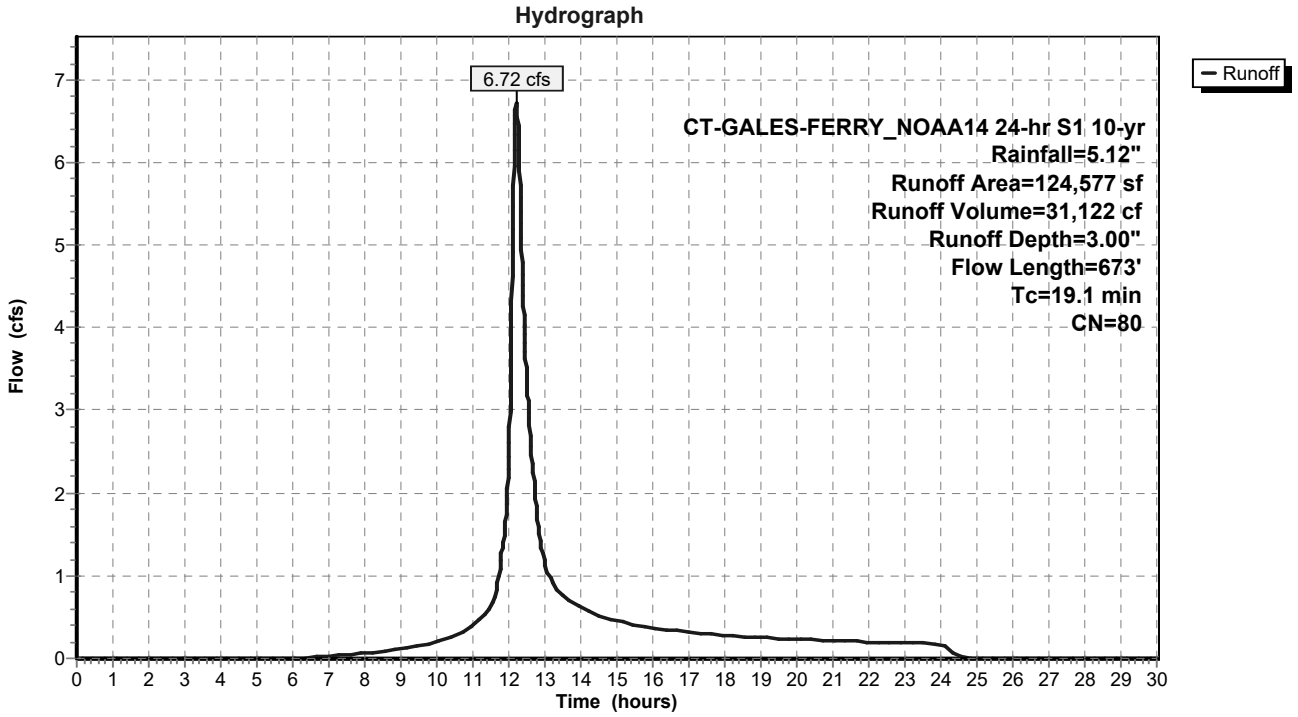
Runoff = 6.72 cfs @ 12.21 hrs, Volume= 31,122 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 10-yr Rainfall=5.12"

Area (sf)	CN	Description
5,812	60	Woods, Fair, HSG B
60,628	79	Woods, Fair, HSG D
21,174	61	>75% Grass cover, Good, HSG B
6,833	80	>75% Grass cover, Good, HSG D
9,925	98	Paved parking, HSG B
6,539	98	Paved parking, HSG D
150	96	Gravel surface, HSG B
2,821	96	Gravel surface, HSG D
10,695	98	Roofs, HSG B
124,577	80	Weighted Average
97,418		78.20% Pervious Area
27,159		21.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	70	0.0528	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.8	30	0.2648	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.4	68	0.3617	3.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	36	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.7	331	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	25	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	66	0.0666	5.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0426	4.19		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.1	673	Total			

Subcatchment PDA-100: PDA-100



Summary for Subcatchment PDA-200: PDA-200

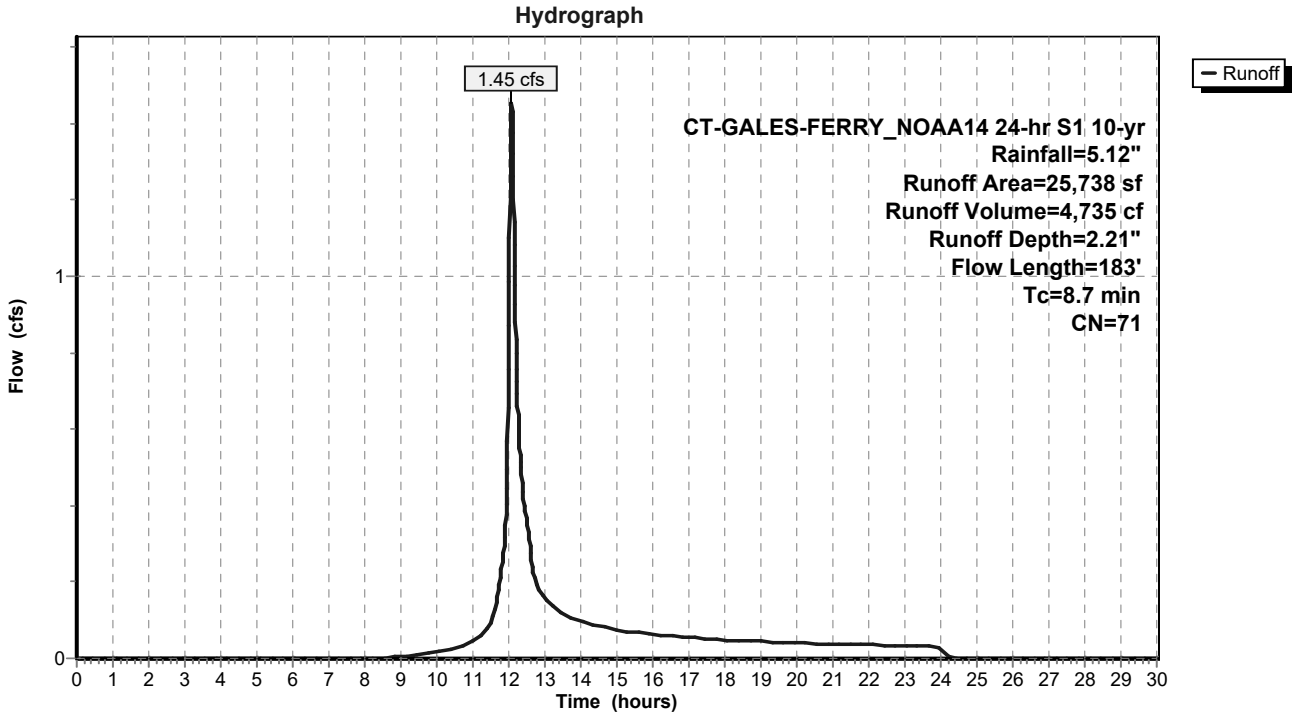
Runoff = 1.45 cfs @ 12.07 hrs, Volume= 4,735 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 10-yr Rainfall=5.12"

Area (sf)	CN	Description
2,265	60	Woods, Fair, HSG B
598	79	Woods, Fair, HSG D
16,063	61	>75% Grass cover, Good, HSG B
123	80	>75% Grass cover, Good, HSG D
6,689	98	Paved parking, HSG B
25,738	71	Weighted Average
19,049		74.01% Pervious Area
6,689		25.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	10	0.0953	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.8	19	0.3100	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
1.0	13	0.0821	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
4.9	58	0.0341	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.3	25	0.0341	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	58	0.0261	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.7	183	Total			

Subcatchment PDA-200: PDA-200



Summary for Pond P1: Stormwater Basin

Inflow Area = 139,303 sf, 24.31% Impervious, Inflow Depth = 3.19" for 10-yr event
Inflow = 9.75 cfs @ 12.13 hrs, Volume= 36,992 cf
Outflow = 2.20 cfs @ 12.64 hrs, Volume= 24,051 cf, Atten= 77%, Lag= 30.6 min
Discarded = 0.14 cfs @ 12.64 hrs, Volume= 9,009 cf
Primary = 2.06 cfs @ 12.64 hrs, Volume= 15,042 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 52.86' @ 12.64 hrs Surf.Area= 5,750 sf Storage= 17,338 cf

Plug-Flow detention time= 307.4 min calculated for 24,051 cf (65% of inflow)
Center-of-Mass det. time= 184.8 min (1,022.6 - 837.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	32,030 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

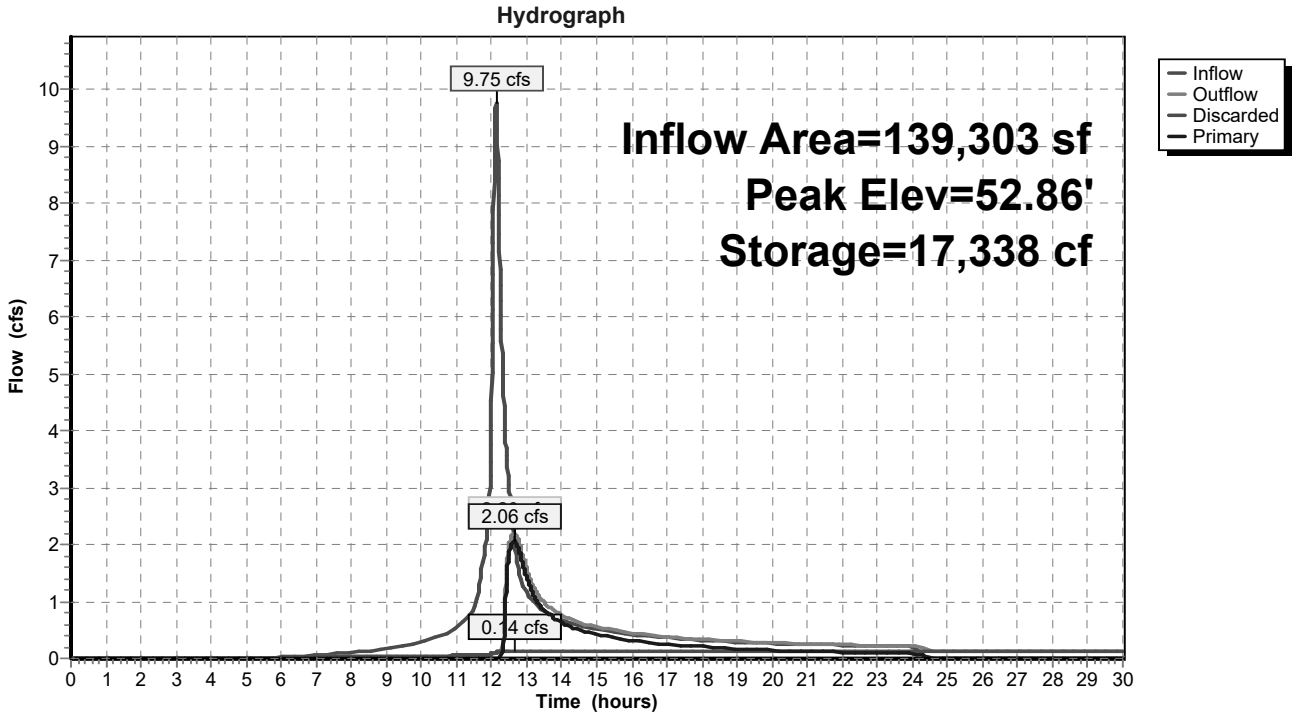
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	1,605	0	0
49.00	2,349	1,977	1,977
50.00	3,150	2,750	4,727
51.00	4,006	3,578	8,305
52.00	4,919	4,463	12,767
53.00	5,889	5,404	18,171
54.00	6,915	6,402	24,573
55.00	7,998	7,457	32,030

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**0.720 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'
#2	Primary	52.08'	**18.0" Round Culvert** L= 147.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 52.08' / 51.44' S= 0.0044 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	52.50'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.14 cfs @ 12.64 hrs HW=52.86' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=2.06 cfs @ 12.64 hrs HW=52.86' (Free Discharge)
↑└**2=Culvert** (Barrel Controls 2.06 cfs @ 3.25 fps)
↑└**3=Broad-Crested Rectangular Weir** (Passes 2.06 cfs of 2.31 cfs potential flow)

Pond P1: Stormwater Basin

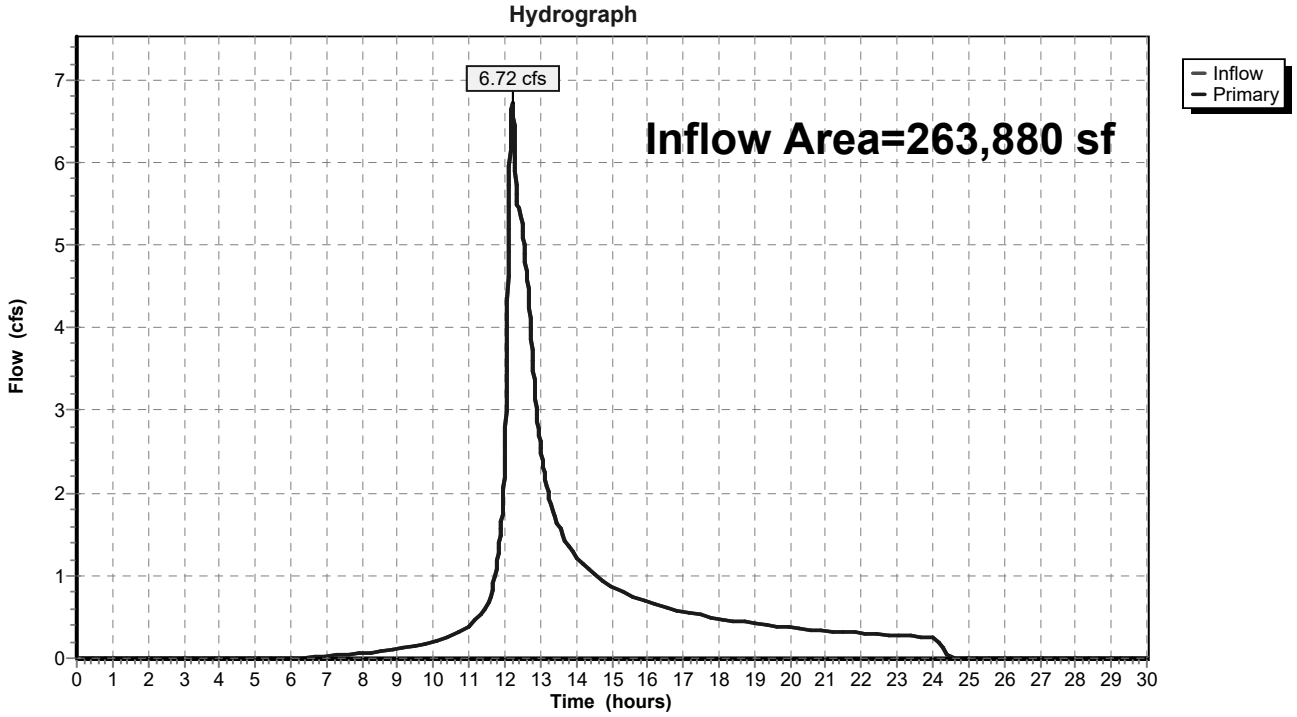


Summary for Link DP-1: DP-1

Inflow Area = 263,880 sf, 23.12% Impervious, Inflow Depth = 2.10" for 10-yr event
Inflow = 6.72 cfs @ 12.21 hrs, Volume= 46,164 cf
Primary = 6.72 cfs @ 12.21 hrs, Volume= 46,164 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

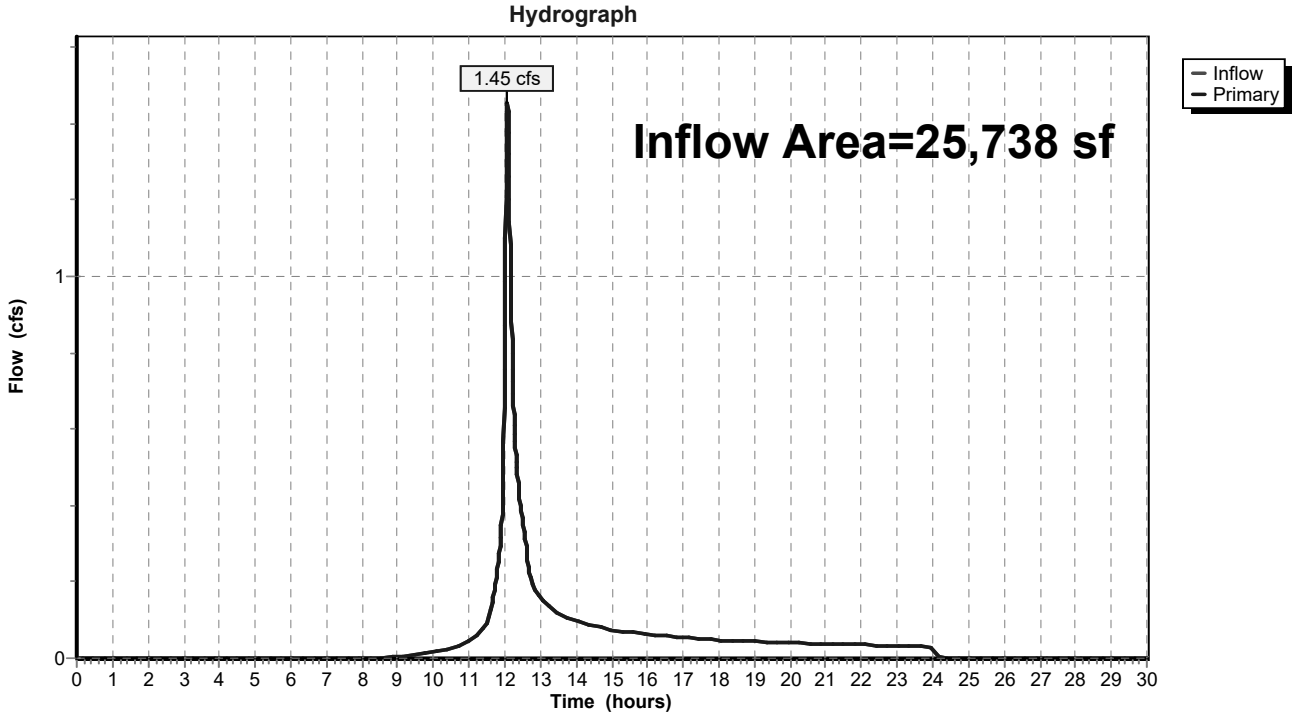


Summary for Link DP-2: DP-2

Inflow Area = 25,738 sf, 25.99% Impervious, Inflow Depth = 2.21" for 10-yr event
Inflow = 1.45 cfs @ 12.07 hrs, Volume= 4,735 cf
Primary = 1.45 cfs @ 12.07 hrs, Volume= 4,735 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PA-300: PA-300 Runoff Area=139,303 sf 24.31% Impervious Runoff Depth=4.13"
Flow Length=423' Tc=12.8 min CN=82 Runoff=12.59 cfs 47,889 cf

Subcatchment PDA-100: PDA-100 Runoff Area=124,577 sf 21.80% Impervious Runoff Depth=3.92"
Flow Length=673' Tc=19.1 min CN=80 Runoff=8.78 cfs 40,663 cf

Subcatchment PDA-200: PDA-200 Runoff Area=25,738 sf 25.99% Impervious Runoff Depth=3.02"
Flow Length=183' Tc=8.7 min CN=71 Runoff=2.02 cfs 6,478 cf

Pond P1: Stormwater Basin Peak Elev=53.27' Storage=19,809 cf Inflow=12.59 cfs 47,889 cf
Discarded=0.15 cfs 9,313 cf Primary=4.24 cfs 25,585 cf Outflow=4.39 cfs 34,899 cf

Link DP-1: DP-1 Inflow=11.62 cfs 66,248 cf
Primary=11.62 cfs 66,248 cf

Link DP-2: DP-2 Inflow=2.02 cfs 6,478 cf
Primary=2.02 cfs 6,478 cf

Total Runoff Area = 289,618 sf Runoff Volume = 95,029 cf Average Runoff Depth = 3.94"
76.62% Pervious = 221,908 sf 23.38% Impervious = 67,710 sf

Summary for Subcatchment PA-300: PA-300

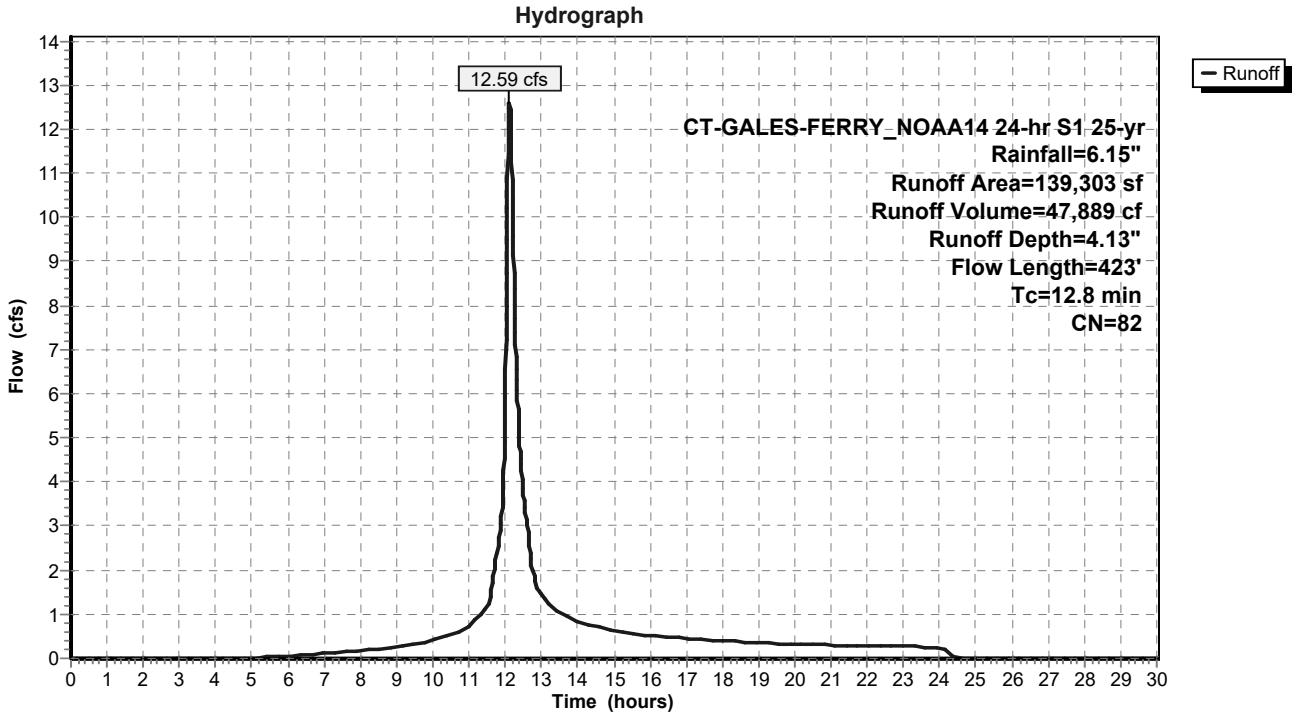
Runoff = 12.59 cfs @ 12.13 hrs, Volume= 47,889 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 25-yr Rainfall=6.15"

Area (sf)	CN	Description
627	60	Woods, Fair, HSG B
60,165	79	Woods, Fair, HSG D
15,389	61	>75% Grass cover, Good, HSG B
29,260	80	>75% Grass cover, Good, HSG D
21,042	98	Paved parking, HSG B
3,051	98	Paved parking, HSG D
2,319	98	Roofs, HSG B
7,450	98	Water Surface, HSG D
139,303	82	Weighted Average
105,441		75.69% Pervious Area
33,862		24.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	31	0.0922	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
3.6	48	0.3621	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
1.3	21	0.9076	0.27		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.1	24	0.4338	3.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	18	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	48	0.1877	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	98	0.0131	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	13	0.3945	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.0169	2.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	79	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.8	423	Total			

Subcatchment PA-300: PA-300



Summary for Subcatchment PDA-100: PDA-100

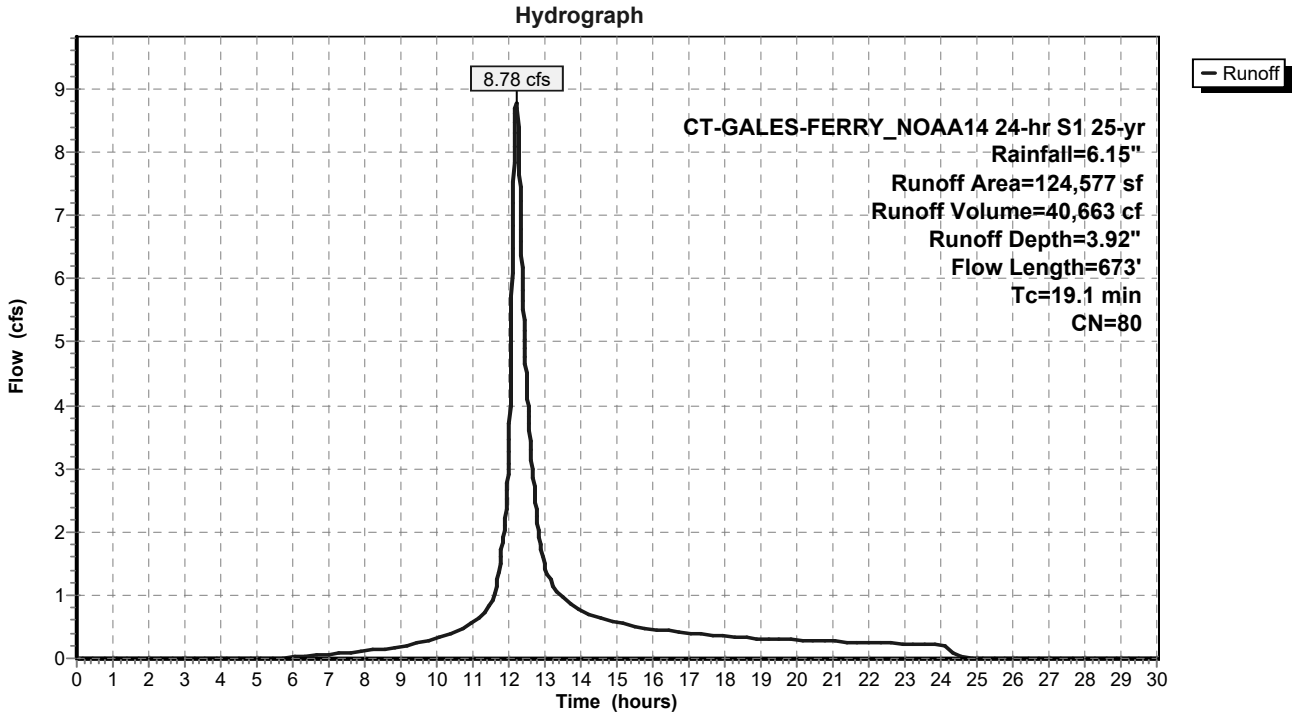
Runoff = 8.78 cfs @ 12.21 hrs, Volume= 40,663 cf, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 25-yr Rainfall=6.15"

Area (sf)	CN	Description
5,812	60	Woods, Fair, HSG B
60,628	79	Woods, Fair, HSG D
21,174	61	>75% Grass cover, Good, HSG B
6,833	80	>75% Grass cover, Good, HSG D
9,925	98	Paved parking, HSG B
6,539	98	Paved parking, HSG D
150	96	Gravel surface, HSG B
2,821	96	Gravel surface, HSG D
10,695	98	Roofs, HSG B
124,577	80	Weighted Average
97,418		78.20% Pervious Area
27,159		21.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	70	0.0528	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.8	30	0.2648	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.4	68	0.3617	3.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	36	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.7	331	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	25	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	66	0.0666	5.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0426	4.19		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.1	673	Total			

Subcatchment PDA-100: PDA-100



Summary for Subcatchment PDA-200: PDA-200

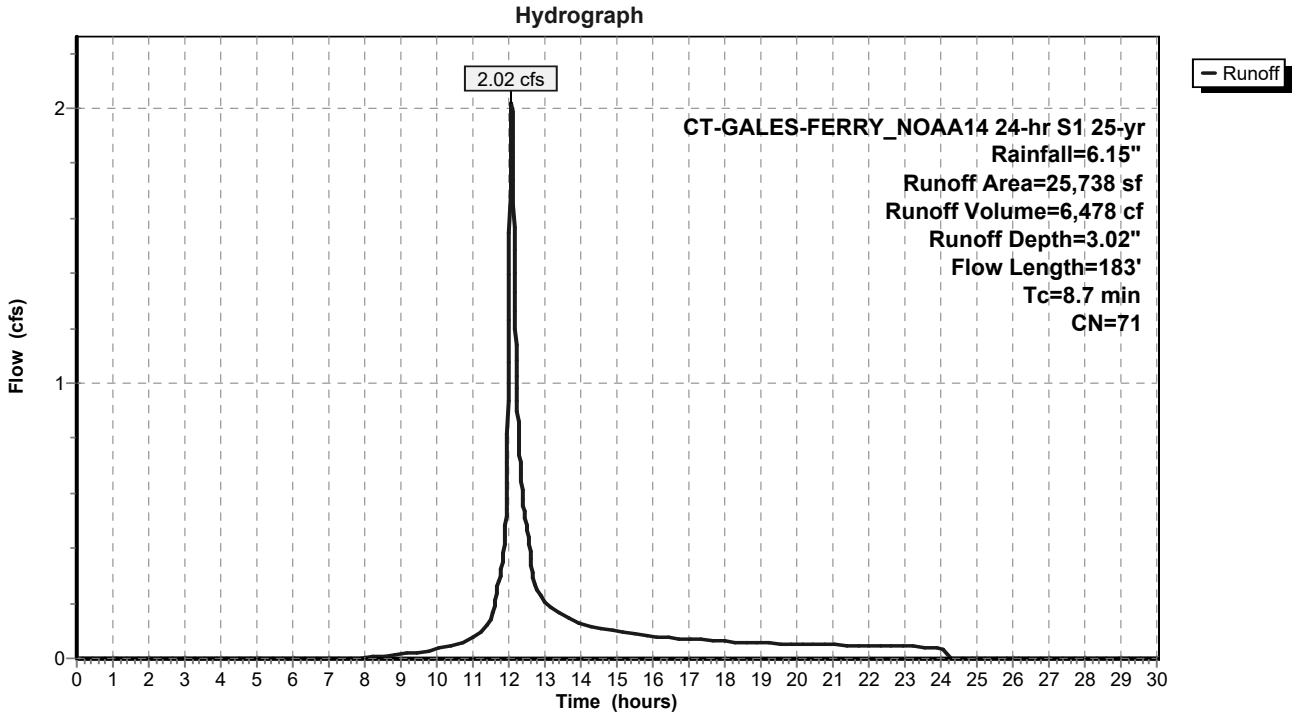
Runoff = 2.02 cfs @ 12.07 hrs, Volume= 6,478 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 25-yr Rainfall=6.15"

Area (sf)	CN	Description
2,265	60	Woods, Fair, HSG B
598	79	Woods, Fair, HSG D
16,063	61	>75% Grass cover, Good, HSG B
123	80	>75% Grass cover, Good, HSG D
6,689	98	Paved parking, HSG B
25,738	71	Weighted Average
19,049		74.01% Pervious Area
6,689		25.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	10	0.0953	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.8	19	0.3100	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
1.0	13	0.0821	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
4.9	58	0.0341	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.3	25	0.0341	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	58	0.0261	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.7	183	Total			

Subcatchment PDA-200: PDA-200



Summary for Pond P1: Stormwater Basin

Inflow Area = 139,303 sf, 24.31% Impervious, Inflow Depth = 4.13" for 25-yr event
Inflow = 12.59 cfs @ 12.13 hrs, Volume= 47,889 cf
Outflow = 4.39 cfs @ 12.43 hrs, Volume= 34,899 cf, Atten= 65%, Lag= 18.4 min
Discarded = 0.15 cfs @ 12.43 hrs, Volume= 9,313 cf
Primary = 4.24 cfs @ 12.43 hrs, Volume= 25,585 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 53.27' @ 12.43 hrs Surf.Area= 6,168 sf Storage= 19,809 cf

Plug-Flow detention time= 245.9 min calculated for 34,899 cf (73% of inflow)
Center-of-Mass det. time= 138.4 min (967.0 - 828.6)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	32,030 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

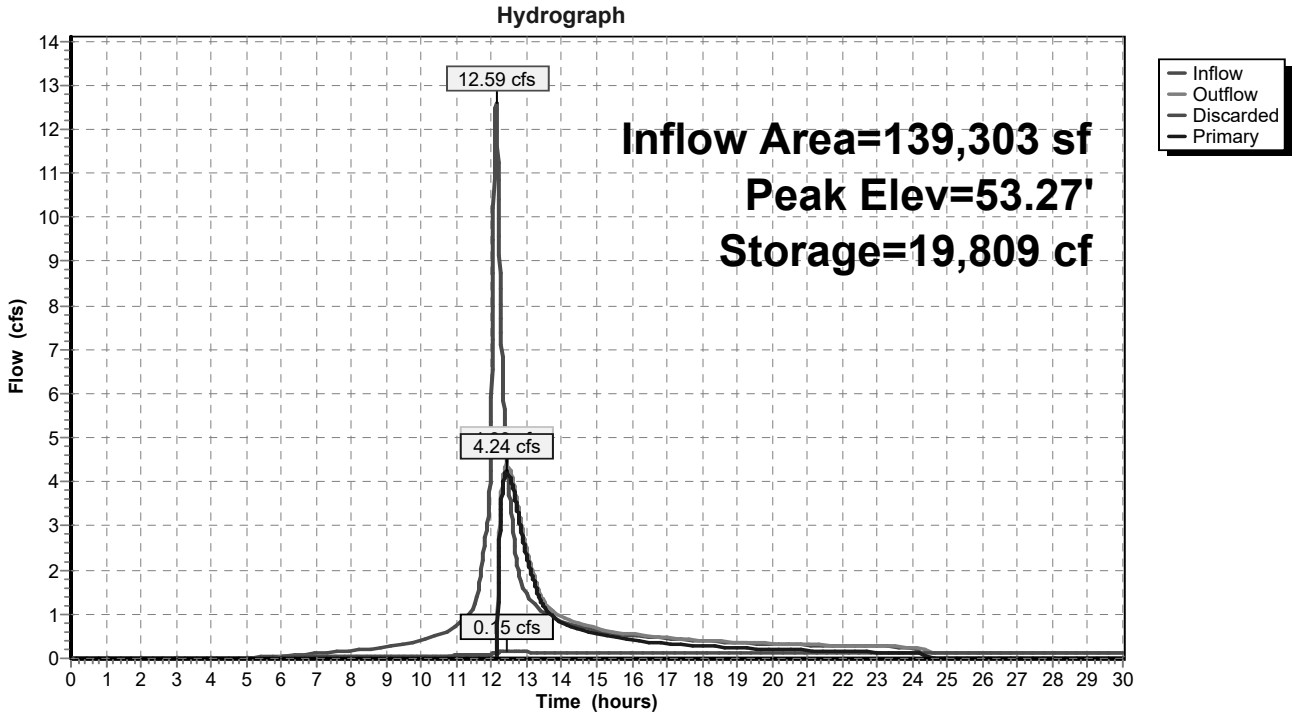
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	1,605	0	0
49.00	2,349	1,977	1,977
50.00	3,150	2,750	4,727
51.00	4,006	3,578	8,305
52.00	4,919	4,463	12,767
53.00	5,889	5,404	18,171
54.00	6,915	6,402	24,573
55.00	7,998	7,457	32,030

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**0.720 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'
#2	Primary	52.08'	**18.0" Round Culvert** L= 147.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 52.08' / 51.44' S= 0.0044 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	52.50'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.15 cfs @ 12.43 hrs HW=53.27' (Free Discharge)
↑**1=Exfiltration** (Controls 0.15 cfs)

Primary OutFlow Max=4.24 cfs @ 12.43 hrs HW=53.27' (Free Discharge)
↑**2=Culvert** (Barrel Controls 4.24 cfs @ 3.86 fps)
↑**3=Broad-Crested Rectangular Weir** (Passes 4.24 cfs of 7.69 cfs potential flow)

Pond P1: Stormwater Basin

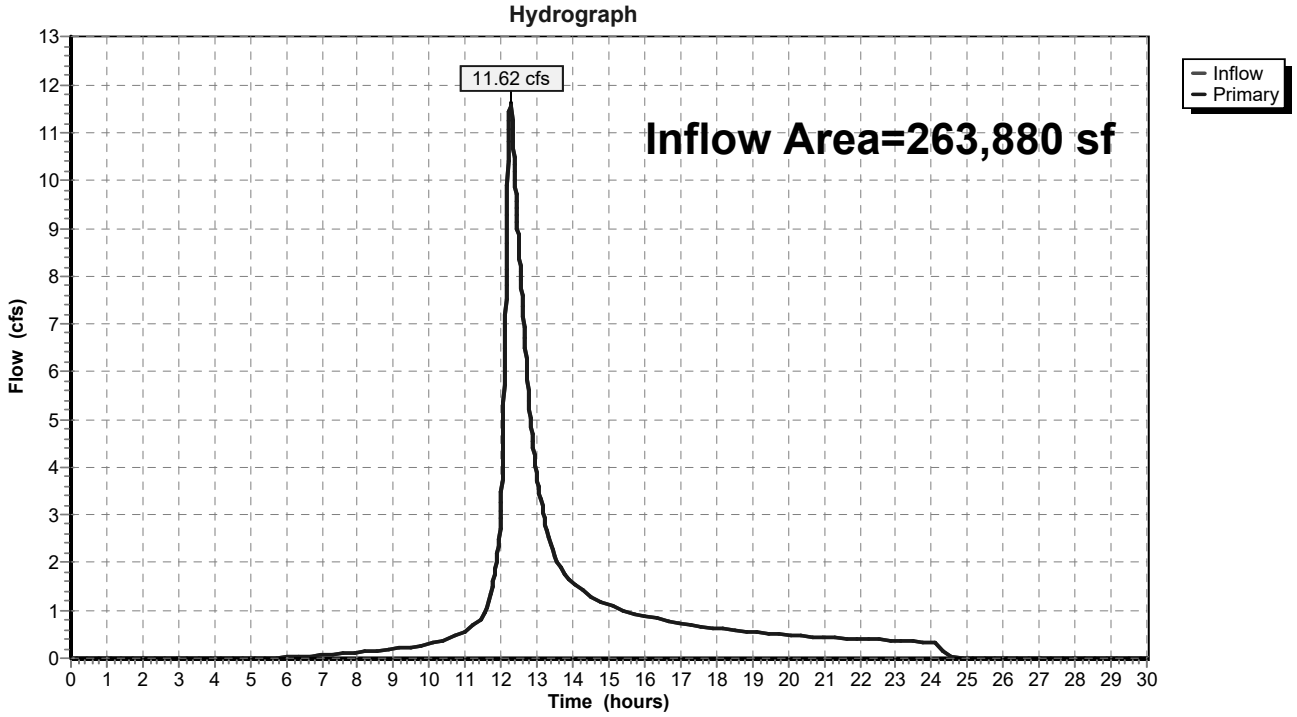


Summary for Link DP-1: DP-1

Inflow Area = 263,880 sf, 23.12% Impervious, Inflow Depth = 3.01" for 25-yr event
Inflow = 11.62 cfs @ 12.26 hrs, Volume= 66,248 cf
Primary = 11.62 cfs @ 12.26 hrs, Volume= 66,248 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

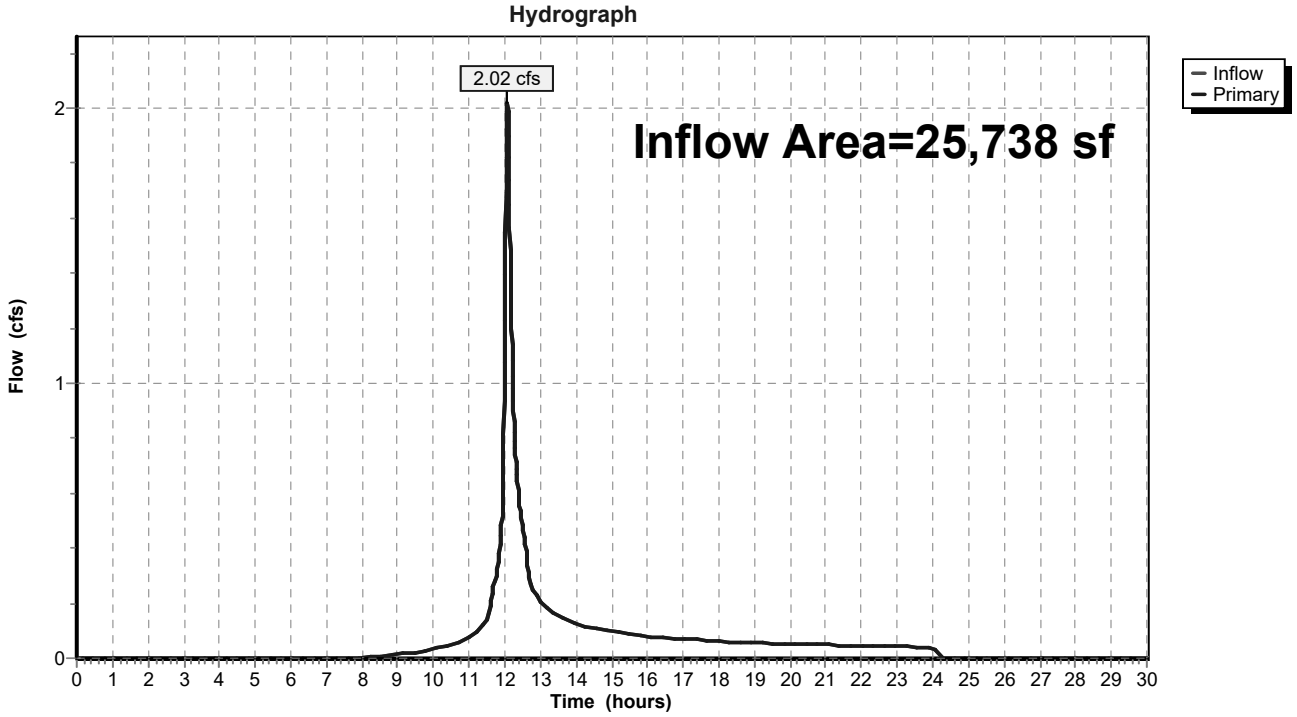


Summary for Link DP-2: DP-2

Inflow Area = 25,738 sf, 25.99% Impervious, Inflow Depth = 3.02" for 25-yr event
Inflow = 2.02 cfs @ 12.07 hrs, Volume= 6,478 cf
Primary = 2.02 cfs @ 12.07 hrs, Volume= 6,478 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PA-300: PA-300 Runoff Area=139,303 sf 24.31% Impervious Runoff Depth=5.62"
Flow Length=423' Tc=12.8 min CN=82 Runoff=17.03 cfs 65,272 cf

Subcatchment PDA-100: PDA-100 Runoff Area=124,577 sf 21.80% Impervious Runoff Depth=5.39"
Flow Length=673' Tc=19.1 min CN=80 Runoff=12.02 cfs 55,966 cf

Subcatchment PDA-200: PDA-200 Runoff Area=25,738 sf 25.99% Impervious Runoff Depth=4.36"
Flow Length=183' Tc=8.7 min CN=71 Runoff=2.95 cfs 9,358 cf

Pond P1: Stormwater Basin Peak Elev=53.99' Storage=24,486 cf Inflow=17.03 cfs 65,272 cf
Discarded=0.17 cfs 9,770 cf Primary=7.40 cfs 42,475 cf Outflow=7.58 cfs 52,245 cf

Link DP-1: DP-1 Inflow=18.99 cfs 98,442 cf
Primary=18.99 cfs 98,442 cf

Link DP-2: DP-2 Inflow=2.95 cfs 9,358 cf
Primary=2.95 cfs 9,358 cf

Total Runoff Area = 289,618 sf Runoff Volume = 130,596 cf Average Runoff Depth = 5.41"
76.62% Pervious = 221,908 sf 23.38% Impervious = 67,710 sf

Summary for Subcatchment PA-300: PA-300

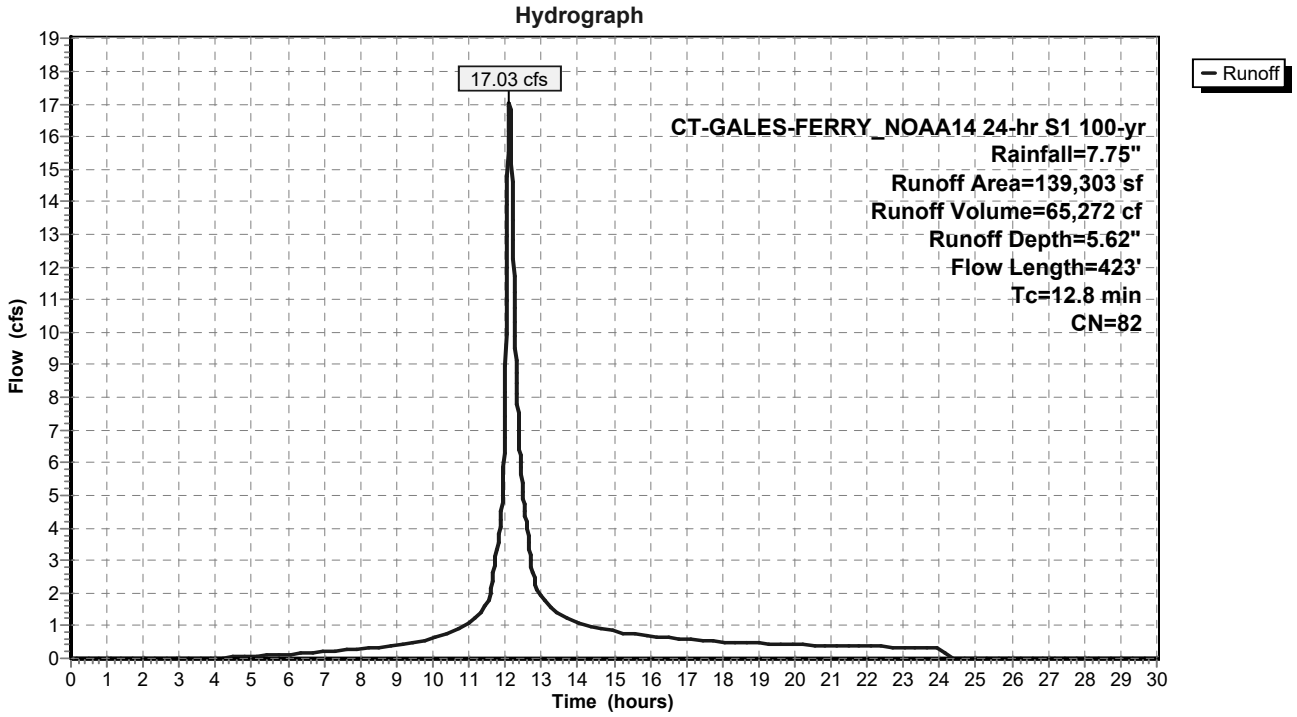
Runoff = 17.03 cfs @ 12.12 hrs, Volume= 65,272 cf, Depth= 5.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 100-yr Rainfall=7.75"

Area (sf)	CN	Description
627	60	Woods, Fair, HSG B
60,165	79	Woods, Fair, HSG D
15,389	61	>75% Grass cover, Good, HSG B
29,260	80	>75% Grass cover, Good, HSG D
21,042	98	Paved parking, HSG B
3,051	98	Paved parking, HSG D
2,319	98	Roofs, HSG B
7,450	98	Water Surface, HSG D
139,303	82	Weighted Average
105,441		75.69% Pervious Area
33,862		24.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	31	0.0922	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
3.6	48	0.3621	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
1.3	21	0.9076	0.27		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.1	24	0.4338	3.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	18	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	48	0.1877	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	98	0.0131	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	13	0.3945	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.0169	2.64		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	79	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.8	423	Total			

Subcatchment PA-300: PA-300



Summary for Subcatchment PDA-100: PDA-100

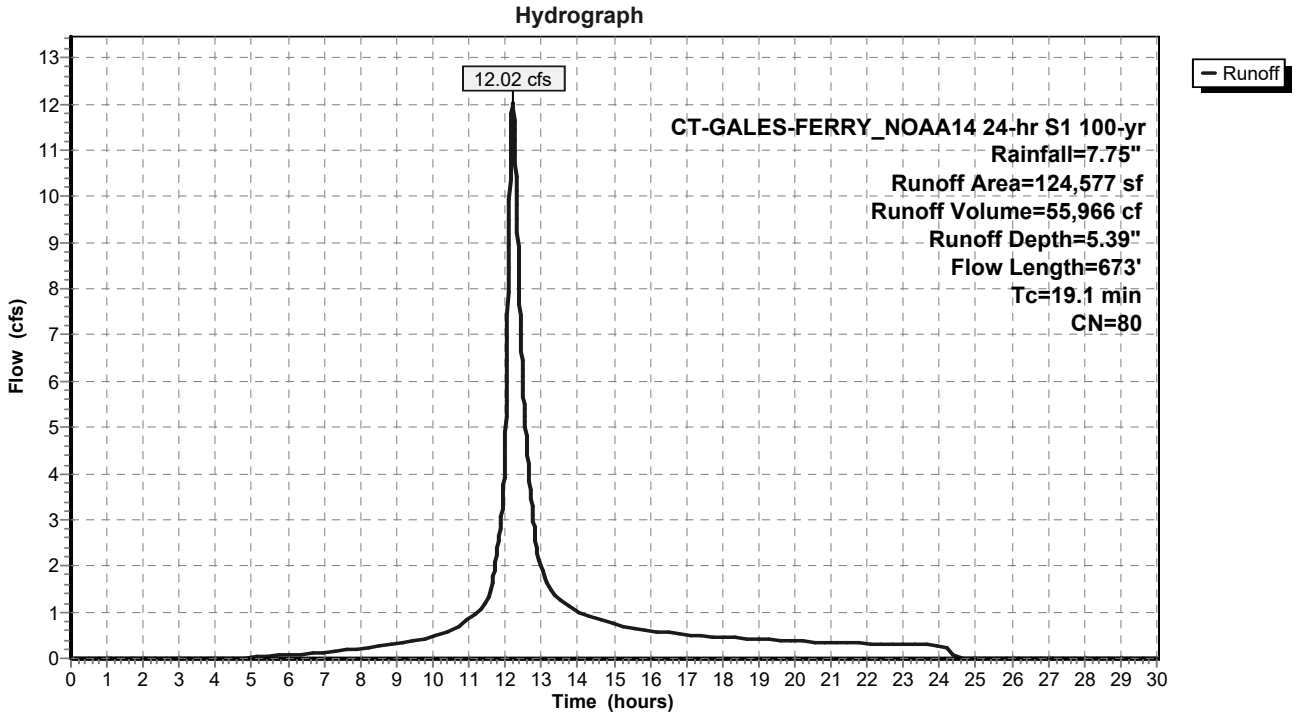
Runoff = 12.02 cfs @ 12.21 hrs, Volume= 55,966 cf, Depth= 5.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 100-yr Rainfall=7.75"

Area (sf)	CN	Description
5,812	60	Woods, Fair, HSG B
60,628	79	Woods, Fair, HSG D
21,174	61	>75% Grass cover, Good, HSG B
6,833	80	>75% Grass cover, Good, HSG D
9,925	98	Paved parking, HSG B
6,539	98	Paved parking, HSG D
150	96	Gravel surface, HSG B
2,821	96	Gravel surface, HSG D
10,695	98	Roofs, HSG B
124,577	80	Weighted Average
97,418		78.20% Pervious Area
27,159		21.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	70	0.0528	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.8	30	0.2648	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
0.4	68	0.3617	3.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	36	1.0000	5.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.7	331	0.0544	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	25	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	66	0.0666	5.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0426	4.19		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.1	673	Total			

Subcatchment PDA-100: PDA-100



Summary for Subcatchment PDA-200: PDA-200

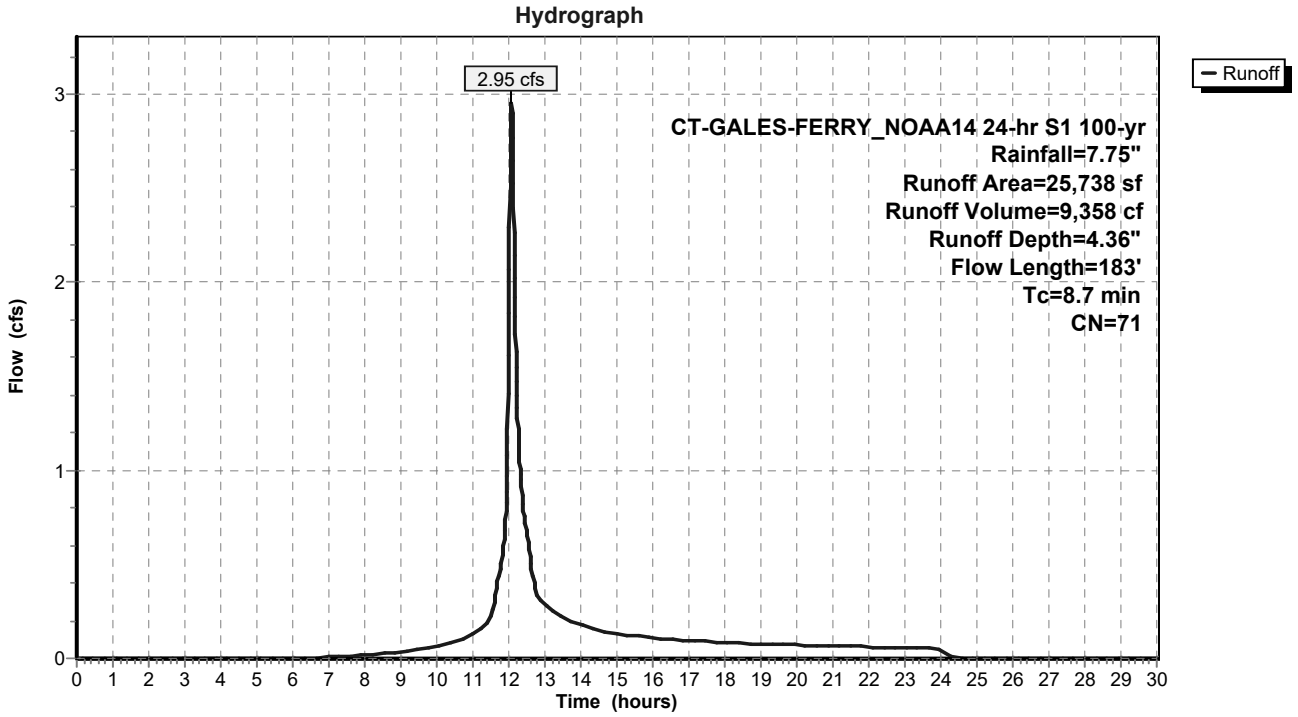
Runoff = 2.95 cfs @ 12.07 hrs, Volume= 9,358 cf, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 24-hr S1 100-yr Rainfall=7.75"

Area (sf)	CN	Description
2,265	60	Woods, Fair, HSG B
598	79	Woods, Fair, HSG D
16,063	61	>75% Grass cover, Good, HSG B
123	80	>75% Grass cover, Good, HSG D
6,689	98	Paved parking, HSG B
25,738	71	Weighted Average
19,049		74.01% Pervious Area
6,689		25.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	10	0.0953	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.8	19	0.3100	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
1.0	13	0.0821	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
4.9	58	0.0341	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.3	25	0.0341	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	58	0.0261	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.7	183	Total			

Subcatchment PDA-200: PDA-200



Summary for Pond P1: Stormwater Basin

Inflow Area = 139,303 sf, 24.31% Impervious, Inflow Depth = 5.62" for 100-yr event
Inflow = 17.03 cfs @ 12.12 hrs, Volume= 65,272 cf
Outflow = 7.58 cfs @ 12.35 hrs, Volume= 52,245 cf, Atten= 56%, Lag= 13.5 min
Discarded = 0.17 cfs @ 12.35 hrs, Volume= 9,770 cf
Primary = 7.40 cfs @ 12.35 hrs, Volume= 42,475 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 53.99' @ 12.35 hrs Surf.Area= 6,902 sf Storage= 24,486 cf

Plug-Flow detention time= 196.1 min calculated for 52,228 cf (80% of inflow)
Center-of-Mass det. time= 107.1 min (924.6 - 817.5)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	32,030 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

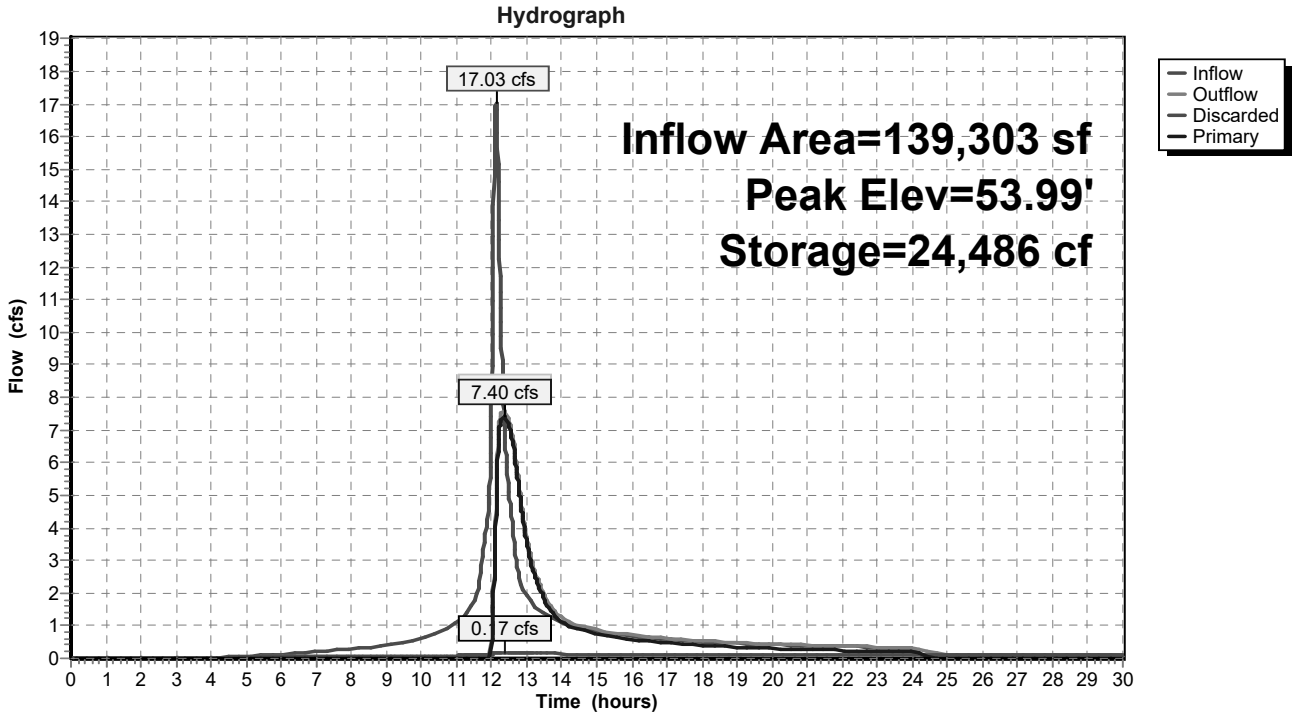
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	1,605	0	0
49.00	2,349	1,977	1,977
50.00	3,150	2,750	4,727
51.00	4,006	3,578	8,305
52.00	4,919	4,463	12,767
53.00	5,889	5,404	18,171
54.00	6,915	6,402	24,573
55.00	7,998	7,457	32,030

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**0.720 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 42.00'
#2	Primary	52.08'	**18.0" Round Culvert** L= 147.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 52.08' / 51.44' S= 0.0044 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	52.50'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.17 cfs @ 12.35 hrs HW=53.99' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=7.41 cfs @ 12.35 hrs HW=53.99' (Free Discharge)
↑└**2=Culvert** (Barrel Controls 7.41 cfs @ 4.26 fps)
↑└**3=Broad-Crested Rectangular Weir** (Passes 7.41 cfs of 23.47 cfs potential flow)

Pond P1: Stormwater Basin

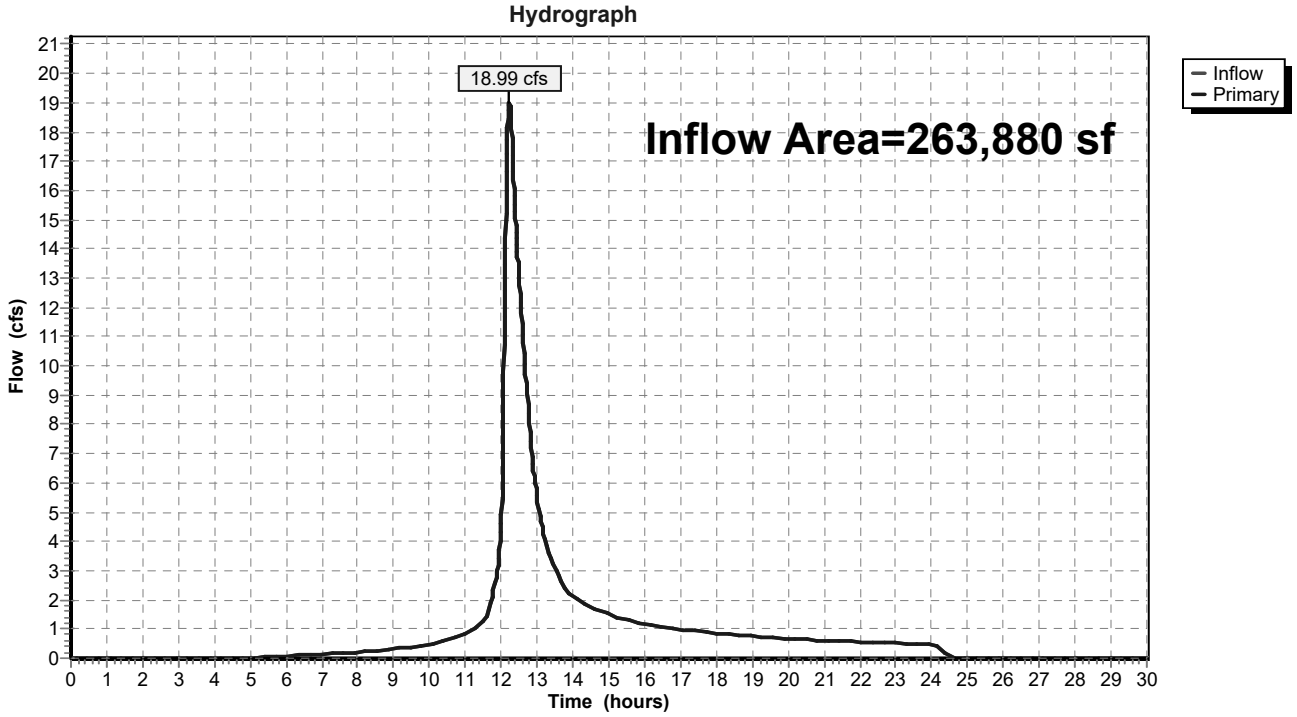


Summary for Link DP-1: DP-1

Inflow Area = 263,880 sf, 23.12% Impervious, Inflow Depth = 4.48" for 100-yr event
Inflow = 18.99 cfs @ 12.23 hrs, Volume= 98,442 cf
Primary = 18.99 cfs @ 12.23 hrs, Volume= 98,442 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1

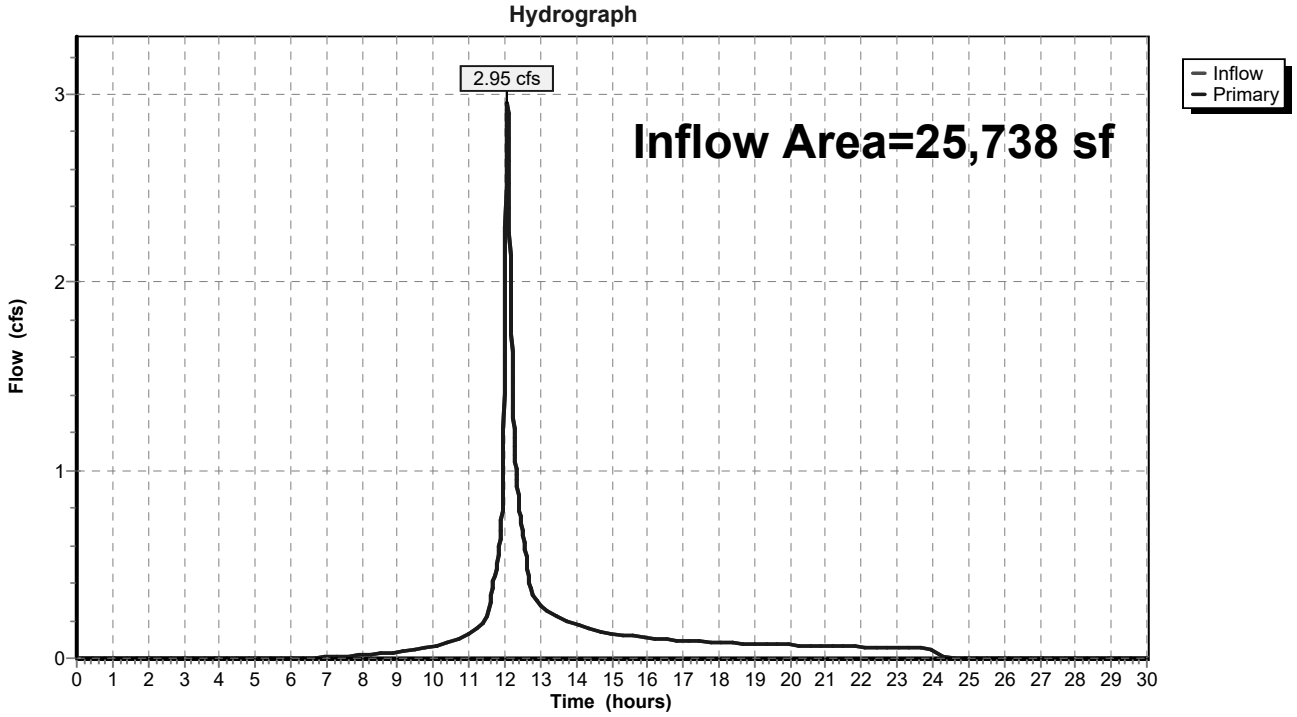


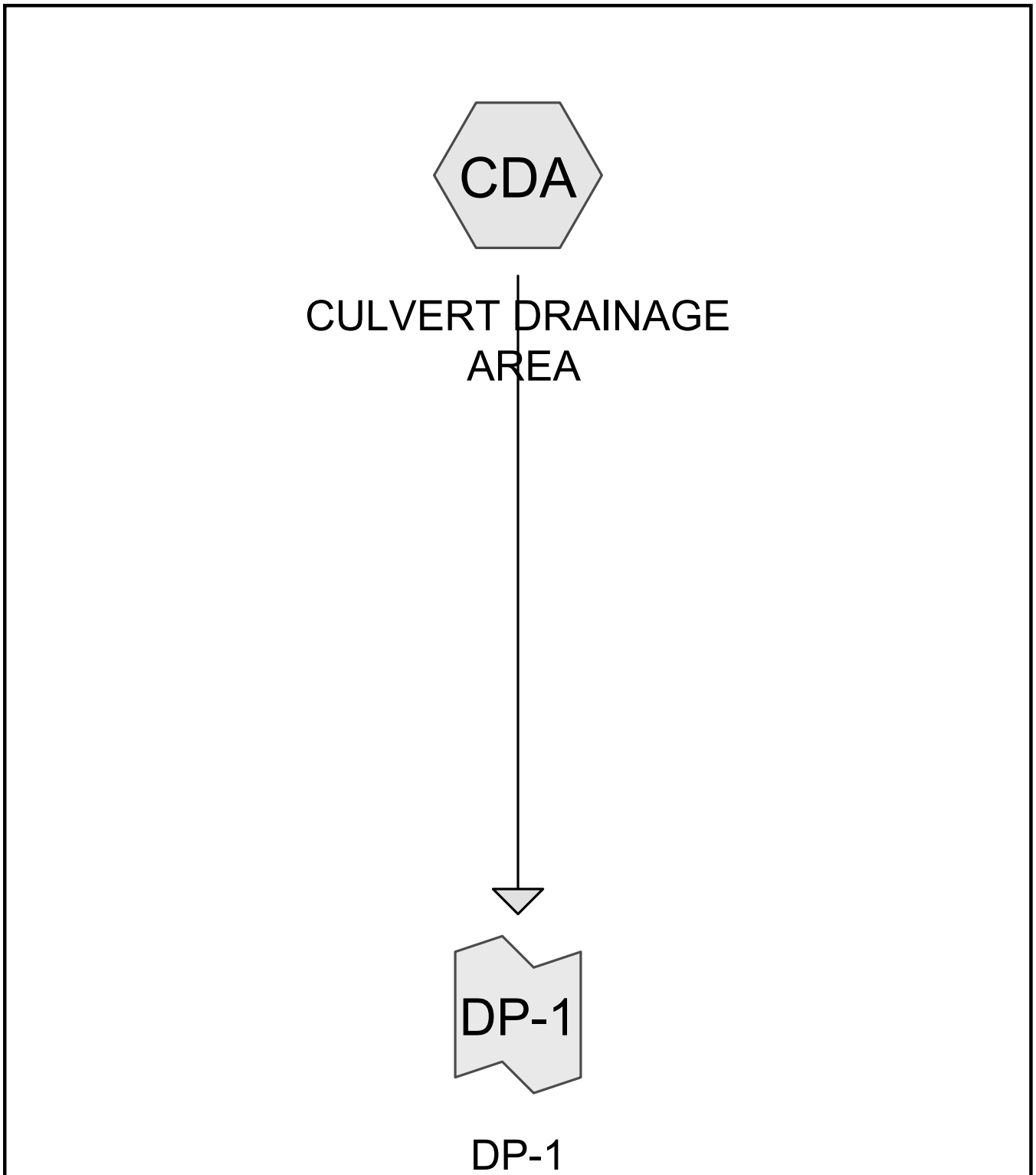
Summary for Link DP-2: DP-2

Inflow Area = 25,738 sf, 25.99% Impervious, Inflow Depth = 4.36" for 100-yr event
Inflow = 2.95 cfs @ 12.07 hrs, Volume= 9,358 cf
Primary = 2.95 cfs @ 12.07 hrs, Volume= 9,358 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-2: DP-2





Routing Diagram for C-DAT-2102412-PROP HYDRO_RATIONAL
Prepared by BL Companies, Printed 7/26/2022

Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CDA: CULVERT DRAINAGE Runoff Area=224,836 sf 0.00% Impervious Runoff Depth=0.07"
Flow Length=1,069' Tc=13.2 min C=0.43 Runoff=4.00 cfs 1,240 cf

Link DP-1: DP-1 Inflow=4.00 cfs 1,240 cf
Primary=4.00 cfs 1,240 cf

Total Runoff Area = 224,836 sf Runoff Volume = 1,240 cf Average Runoff Depth = 0.07"
100.00% Pervious = 224,836 sf 0.00% Impervious = 0 sf

Summary for Subcatchment CDA: CULVERT DRAINAGE AREA

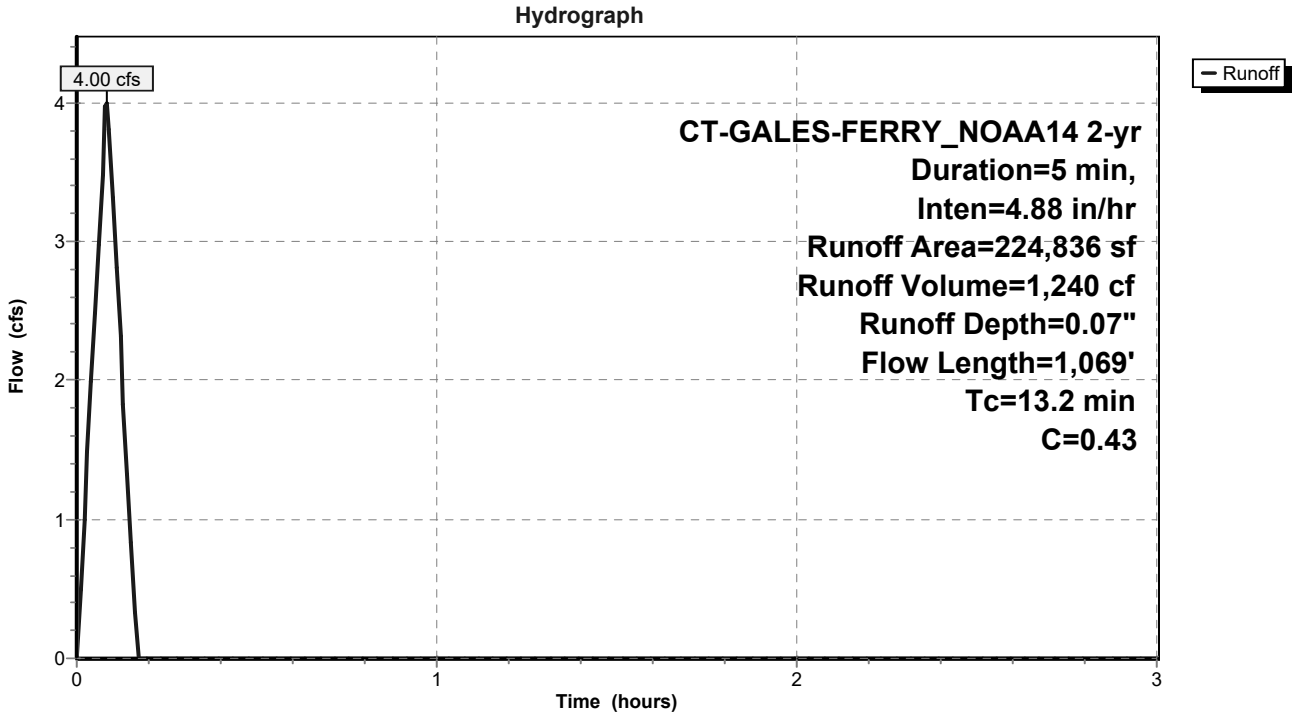
Runoff = 4.00 cfs @ 0.08 hrs, Volume= 1,240 cf, Depth= 0.07"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 2-yr Duration=5 min, Inten=4.88 in/hr

Area (sf)	C	Description
48,194	0.90	Impervious Surfaces
176,642	0.30	Pervious Surfaces
224,836	0.43	Weighted Average
224,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	61	0.1811	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.0	39	0.1531	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.0	6	0.1531	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1075	6.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	63	0.2865	3.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	41	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	56	0.0355	3.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	159	0.0449	4.30		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	279	0.0499	4.53		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.1	333	0.0651	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.2	1,069	Total			

Subcatchment CDA: CULVERT DRAINAGE AREA

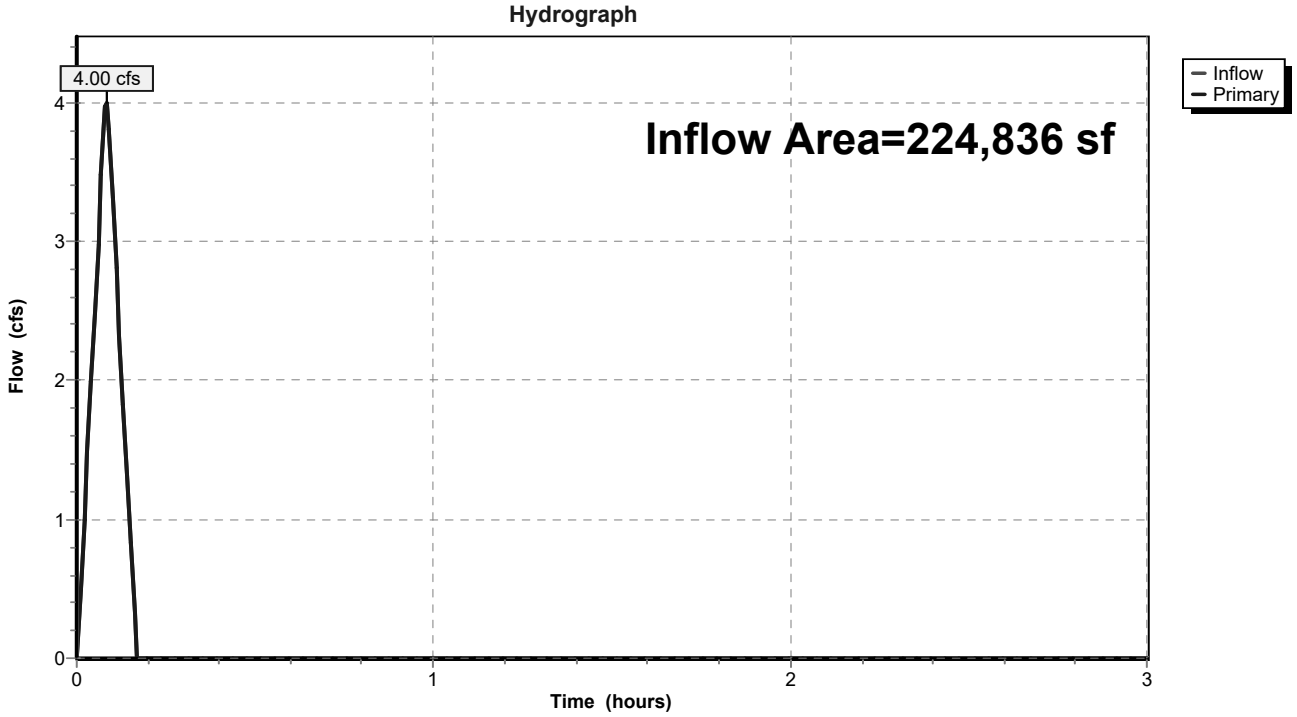


Summary for Link DP-1: DP-1

Inflow Area = 224,836 sf, 0.00% Impervious, Inflow Depth = 0.07" for 2-yr event
Inflow = 4.00 cfs @ 0.08 hrs, Volume= 1,240 cf
Primary = 4.00 cfs @ 0.08 hrs, Volume= 1,240 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CDA: CULVERT DRAINAGE Runoff Area=224,836 sf 0.00% Impervious Runoff Depth=0.10"
Flow Length=1,069' Tc=13.2 min C=0.43 Runoff=5.94 cfs 1,843 cf

Link DP-1: DP-1 Inflow=5.94 cfs 1,843 cf
Primary=5.94 cfs 1,843 cf

Total Runoff Area = 224,836 sf Runoff Volume = 1,843 cf Average Runoff Depth = 0.10"
100.00% Pervious = 224,836 sf 0.00% Impervious = 0 sf

Summary for Subcatchment CDA: CULVERT DRAINAGE AREA

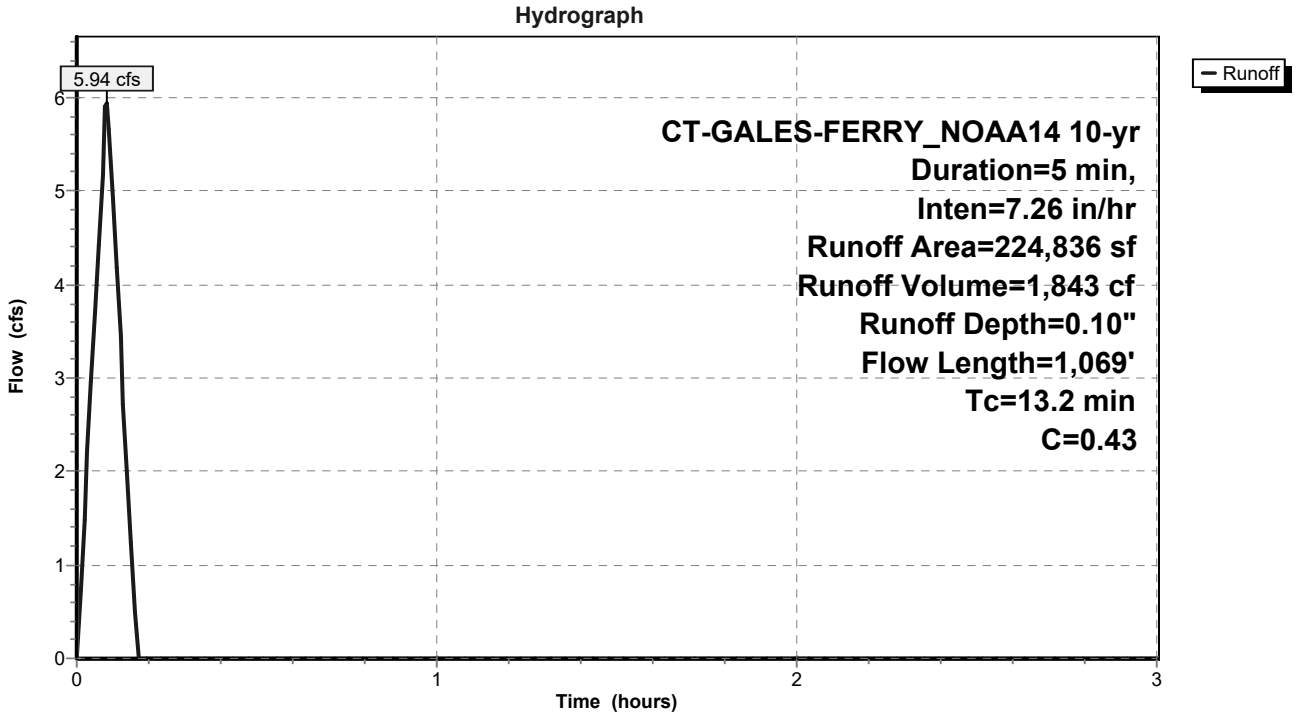
Runoff = 5.94 cfs @ 0.08 hrs, Volume= 1,843 cf, Depth= 0.10"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 10-yr Duration=5 min, Inten=7.26 in/hr

Area (sf)	C	Description
48,194	0.90	Impervious Surfaces
176,642	0.30	Pervious Surfaces
224,836	0.43	Weighted Average
224,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	61	0.1811	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.0	39	0.1531	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.0	6	0.1531	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1075	6.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	63	0.2865	3.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	41	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	56	0.0355	3.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	159	0.0449	4.30		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	279	0.0499	4.53		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.1	333	0.0651	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.2	1,069	Total			

Subcatchment CDA: CULVERT DRAINAGE AREA

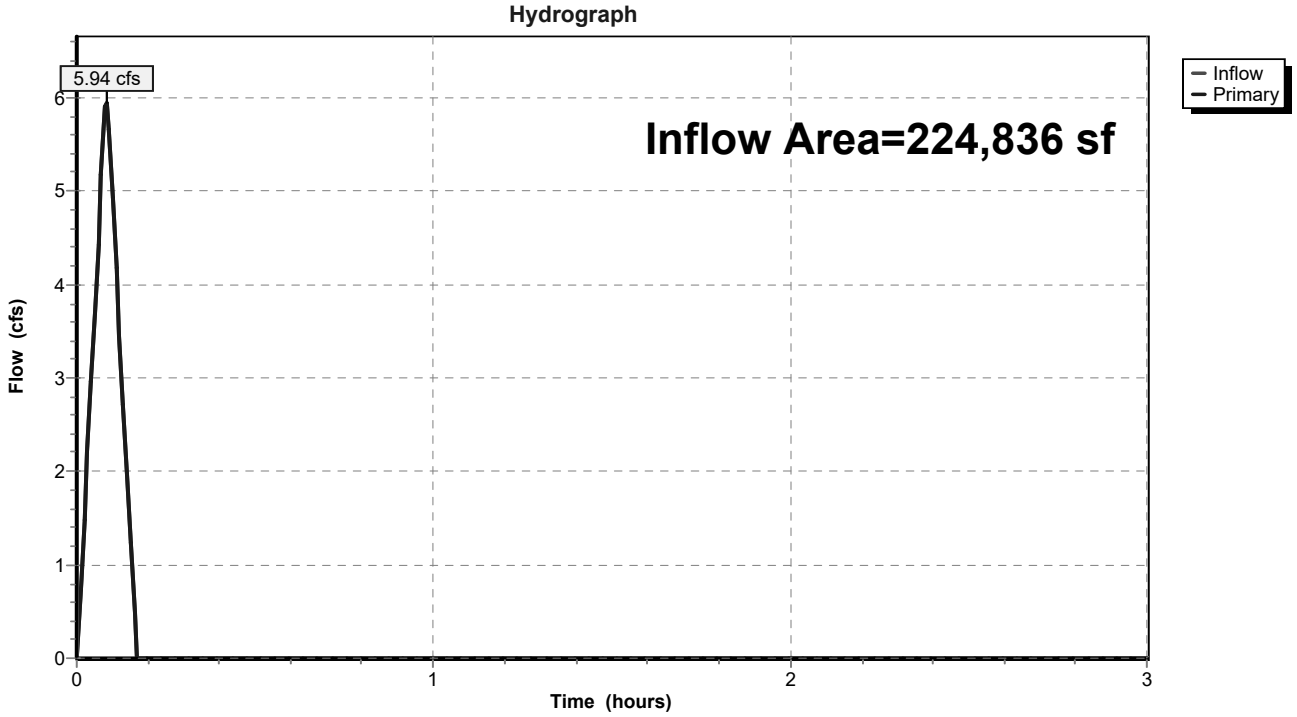


Summary for Link DP-1: DP-1

Inflow Area = 224,836 sf, 0.00% Impervious, Inflow Depth = 0.10" for 10-yr event
Inflow = 5.94 cfs @ 0.08 hrs, Volume= 1,843 cf
Primary = 5.94 cfs @ 0.08 hrs, Volume= 1,843 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CDA: CULVERT DRAINAGE Runoff Area=224,836 sf 0.00% Impervious Runoff Depth=0.12"
Flow Length=1,069' Tc=13.2 min C=0.43 Runoff=7.15 cfs 2,218 cf

Link DP-1: DP-1 Inflow=7.15 cfs 2,218 cf
Primary=7.15 cfs 2,218 cf

Total Runoff Area = 224,836 sf Runoff Volume = 2,218 cf Average Runoff Depth = 0.12"
100.00% Pervious = 224,836 sf 0.00% Impervious = 0 sf

Summary for Subcatchment CDA: CULVERT DRAINAGE AREA

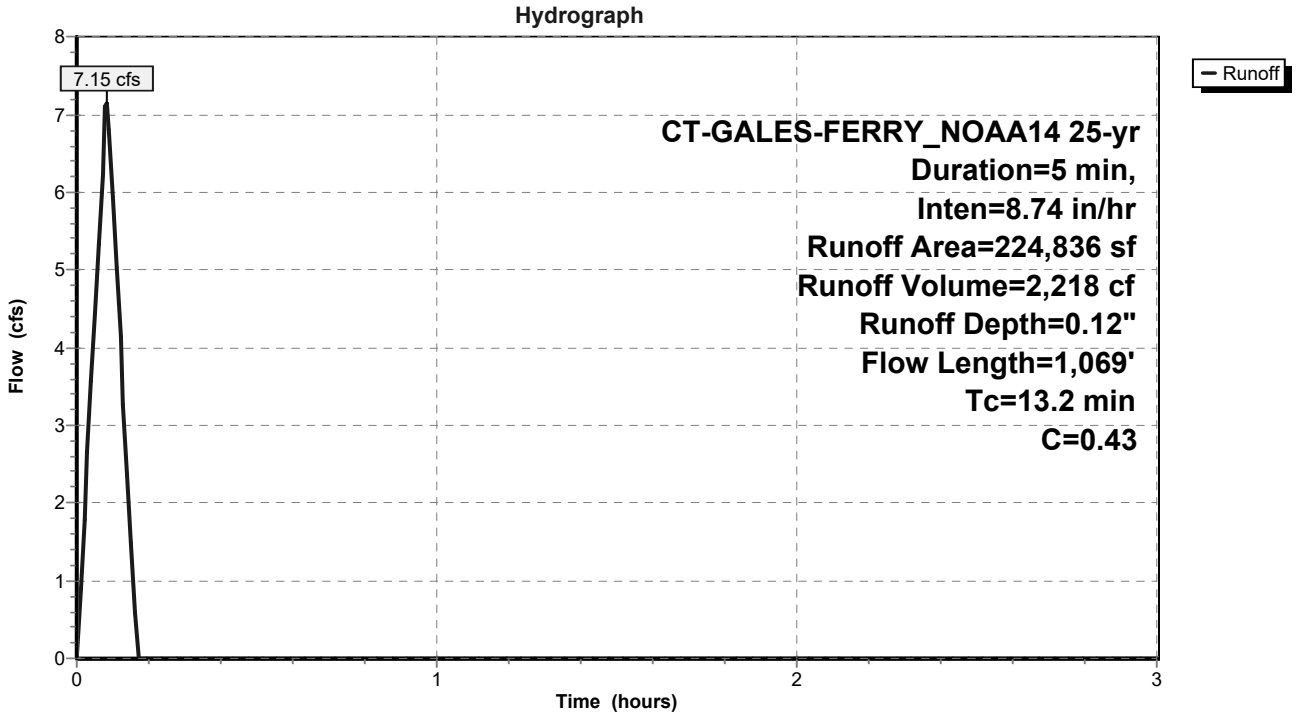
Runoff = 7.15 cfs @ 0.08 hrs, Volume= 2,218 cf, Depth= 0.12"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 25-yr Duration=5 min, Inten=8.74 in/hr

Area (sf)	C	Description
48,194	0.90	Impervious Surfaces
176,642	0.30	Pervious Surfaces
224,836	0.43	Weighted Average
224,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	61	0.1811	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.0	39	0.1531	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.0	6	0.1531	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1075	6.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	63	0.2865	3.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	41	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	56	0.0355	3.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	159	0.0449	4.30		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	279	0.0499	4.53		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.1	333	0.0651	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.2	1,069	Total			

Subcatchment CDA: CULVERT DRAINAGE AREA

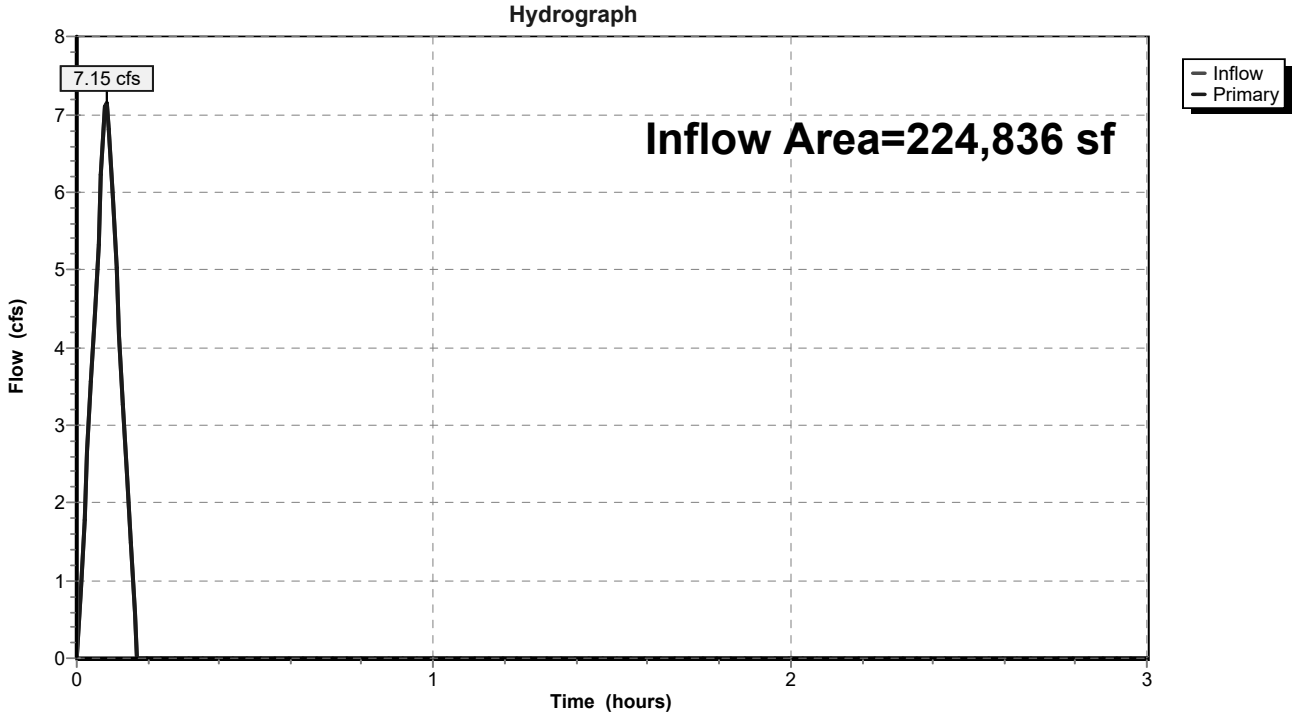


Summary for Link DP-1: DP-1

Inflow Area = 224,836 sf, 0.00% Impervious, Inflow Depth = 0.12" for 25-yr event
Inflow = 7.15 cfs @ 0.08 hrs, Volume= 2,218 cf
Primary = 7.15 cfs @ 0.08 hrs, Volume= 2,218 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CDA: CULVERT DRAINAGE Runoff Area=224,836 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=1,069' Tc=13.2 min C=0.43 Runoff=8.06 cfs 2,501 cf

Link DP-1: DP-1 Inflow=8.06 cfs 2,501 cf
Primary=8.06 cfs 2,501 cf

Total Runoff Area = 224,836 sf Runoff Volume = 2,501 cf Average Runoff Depth = 0.13"
100.00% Pervious = 224,836 sf 0.00% Impervious = 0 sf

Summary for Subcatchment CDA: CULVERT DRAINAGE AREA

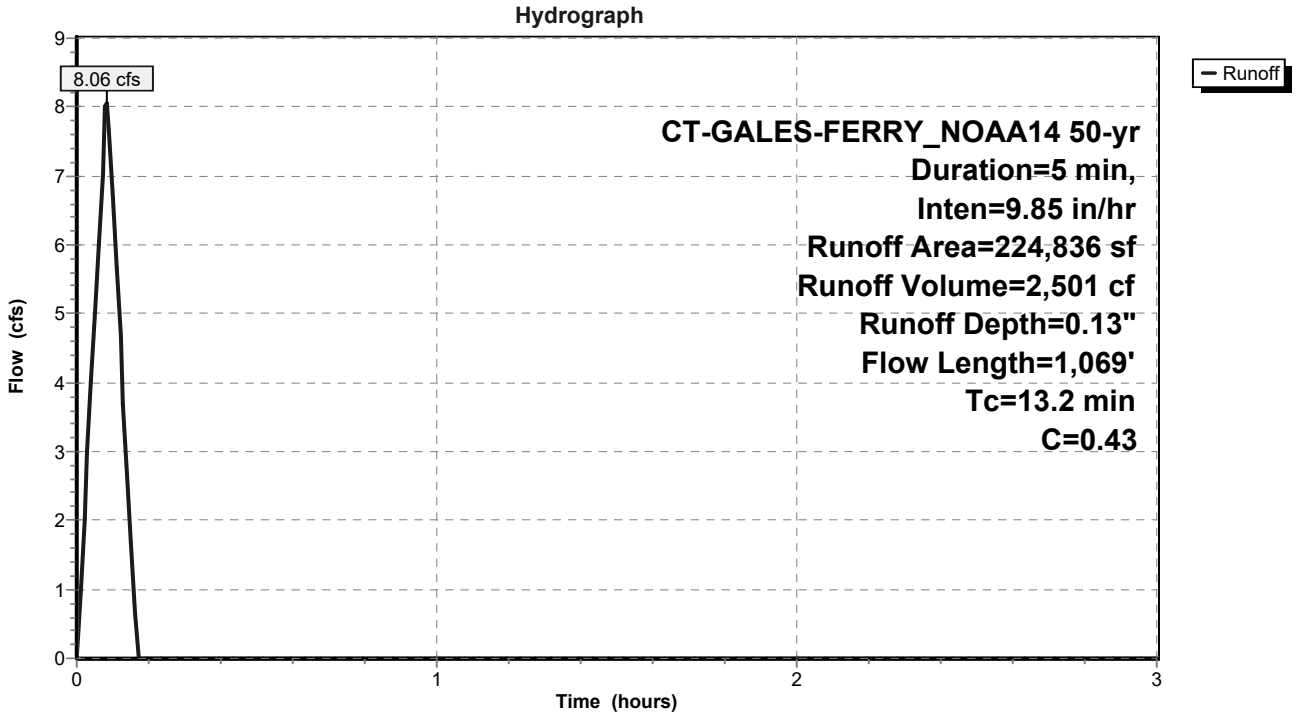
Runoff = 8.06 cfs @ 0.08 hrs, Volume= 2,501 cf, Depth= 0.13"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 50-yr Duration=5 min, Inten=9.85 in/hr

Area (sf)	C	Description
48,194	0.90	Impervious Surfaces
176,642	0.30	Pervious Surfaces
224,836	0.43	Weighted Average
224,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	61	0.1811	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.0	39	0.1531	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.0	6	0.1531	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1075	6.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	63	0.2865	3.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	41	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	56	0.0355	3.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	159	0.0449	4.30		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	279	0.0499	4.53		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.1	333	0.0651	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.2	1,069	Total			

Subcatchment CDA: CULVERT DRAINAGE AREA

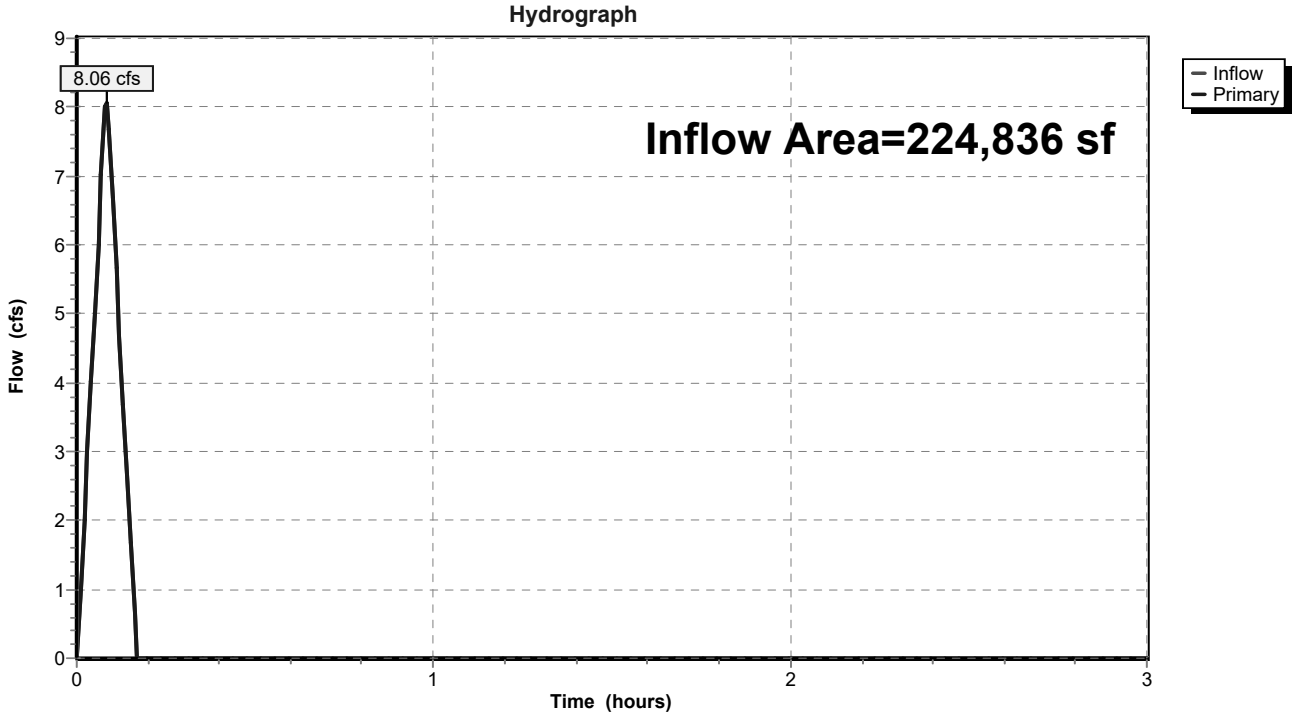


Summary for Link DP-1: DP-1

Inflow Area = 224,836 sf, 0.00% Impervious, Inflow Depth = 0.13" for 50-yr event
Inflow = 8.06 cfs @ 0.08 hrs, Volume= 2,501 cf
Primary = 8.06 cfs @ 0.08 hrs, Volume= 2,501 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1



Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CDA: CULVERT DRAINAGE Runoff Area=224,836 sf 0.00% Impervious Runoff Depth=0.15"
Flow Length=1,069' Tc=13.2 min C=0.43 Runoff=9.02 cfs 2,800 cf

Link DP-1: DP-1 Inflow=9.02 cfs 2,800 cf
Primary=9.02 cfs 2,800 cf

Total Runoff Area = 224,836 sf Runoff Volume = 2,800 cf Average Runoff Depth = 0.15"
100.00% Pervious = 224,836 sf 0.00% Impervious = 0 sf

Summary for Subcatchment CDA: CULVERT DRAINAGE AREA

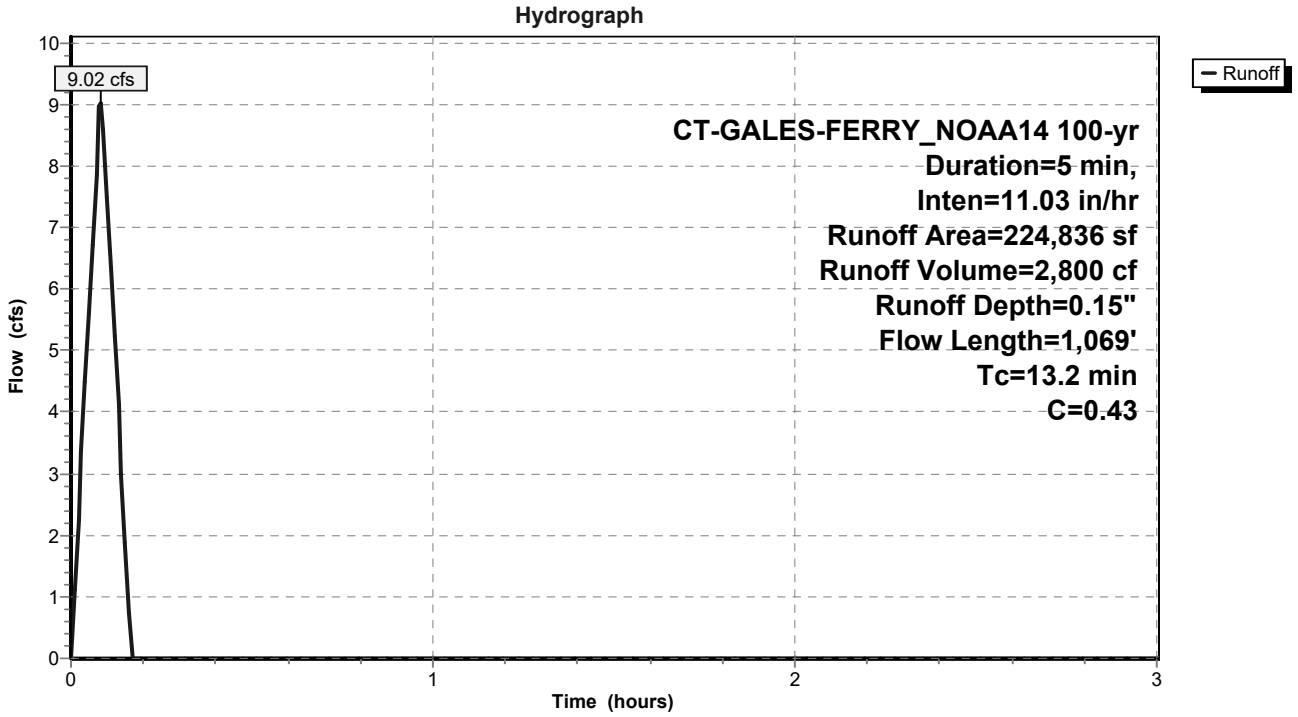
Runoff = 9.02 cfs @ 0.08 hrs, Volume= 2,800 cf, Depth= 0.15"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-GALES-FERRY_NOAA14 100-yr Duration=5 min, Inten=11.03 in/hr

Area (sf)	C	Description
48,194	0.90	Impervious Surfaces
176,642	0.30	Pervious Surfaces
224,836	0.43	Weighted Average
224,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	61	0.1811	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.46"
2.0	39	0.1531	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.46"
0.0	6	0.1531	2.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1075	6.66		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	63	0.2865	3.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	41	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	56	0.0355	3.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	159	0.0449	4.30		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	279	0.0499	4.53		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.1	333	0.0651	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.2	1,069	Total			

Subcatchment CDA: CULVERT DRAINAGE AREA

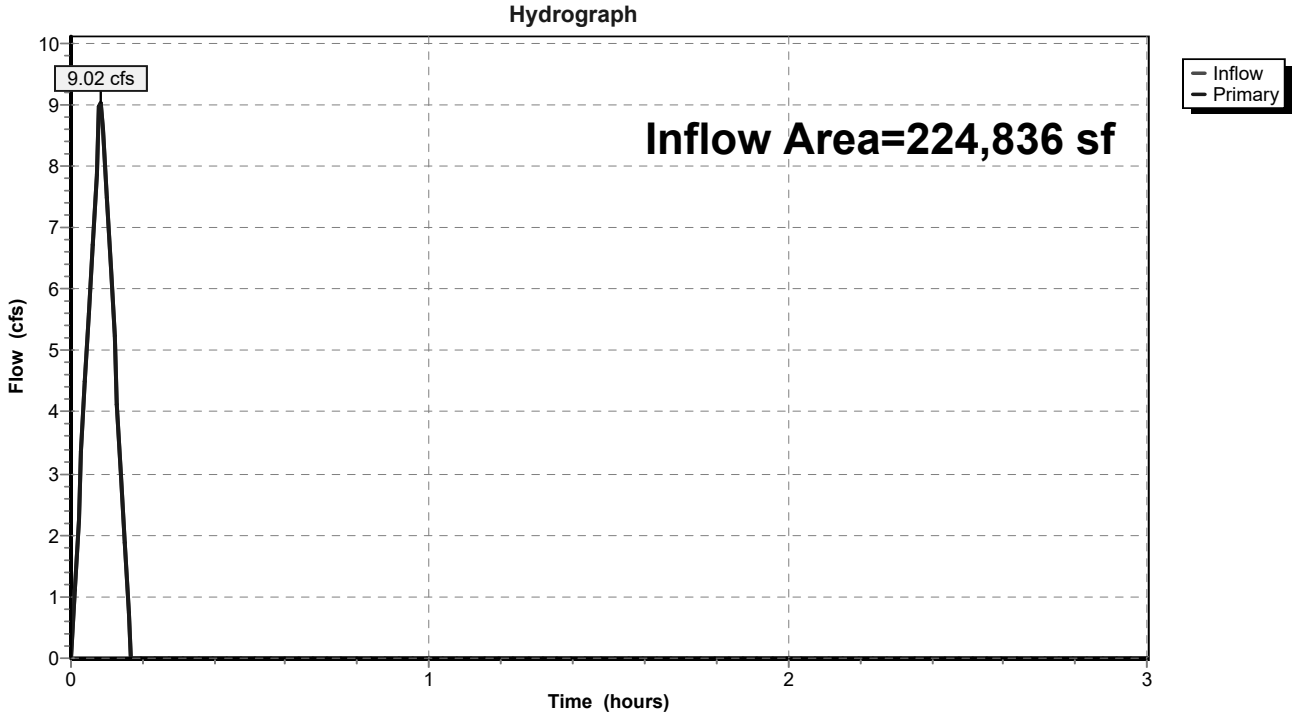


Summary for Link DP-1: DP-1

Inflow Area = 224,836 sf, 0.00% Impervious, Inflow Depth = 0.15" for 100-yr event
Inflow = 9.02 cfs @ 0.08 hrs, Volume= 2,800 cf
Primary = 9.02 cfs @ 0.08 hrs, Volume= 2,800 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-1: DP-1



APPENDIX D

Proposed Conditions Hydraulic Calculations

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jul 26 2022

Circular Culvert

Invert Elev Dn (ft)	=	49.20
Pipe Length (ft)	=	88.80
Slope (%)	=	3.49
Invert Elev Up (ft)	=	52.30
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

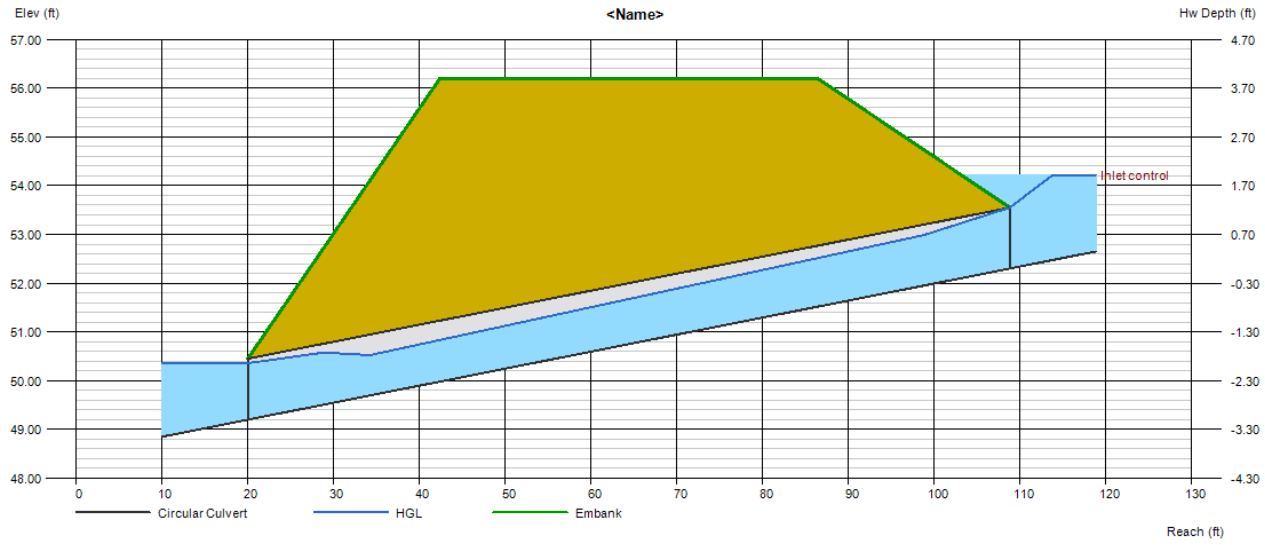
Top Elevation (ft)	=	56.20
Top Width (ft)	=	44.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	7.15
Qmax (cfs)	=	9.02
Tailwater Elev (ft)	=	(dc+D)/2

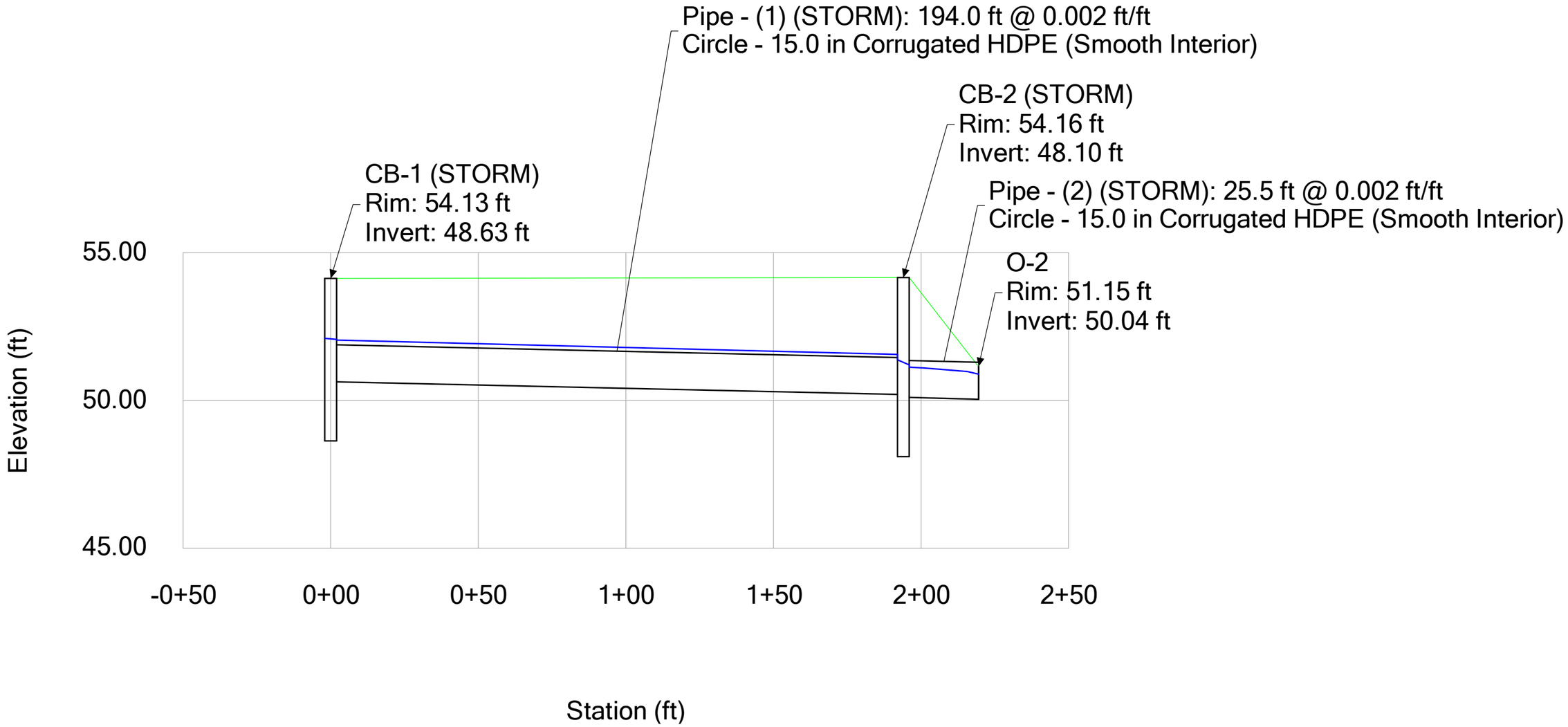
Highlighted

Qtotal (cfs)	=	7.15
Qpipe (cfs)	=	7.15
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.02
Veloc Up (ft/s)	=	6.40
HGL Dn (ft)	=	50.36
HGL Up (ft)	=	53.37
Hw Elev (ft)	=	54.22
Hw/D (ft)	=	1.53
Flow Regime	=	Inlet Control

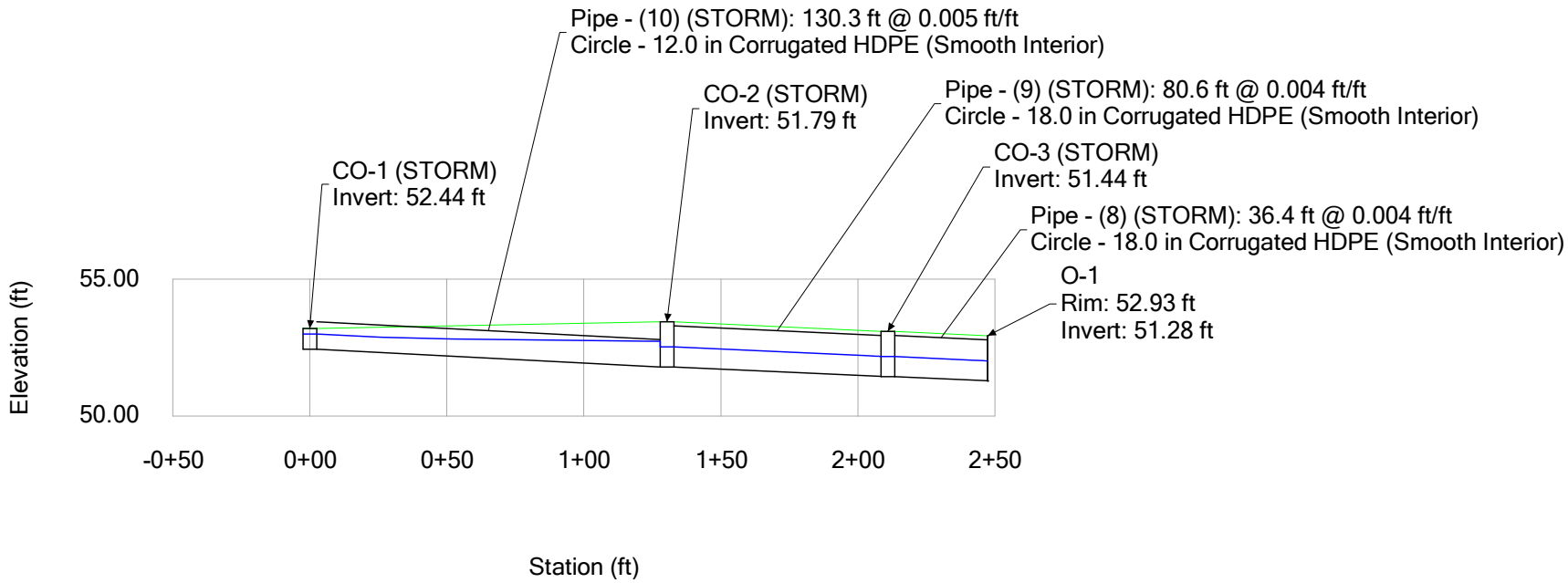


Profile Report

Engineering Profile - CB-1 (STORM) to O-2 (C-CALC-2102412-Proposed Hydraulics.stsw)

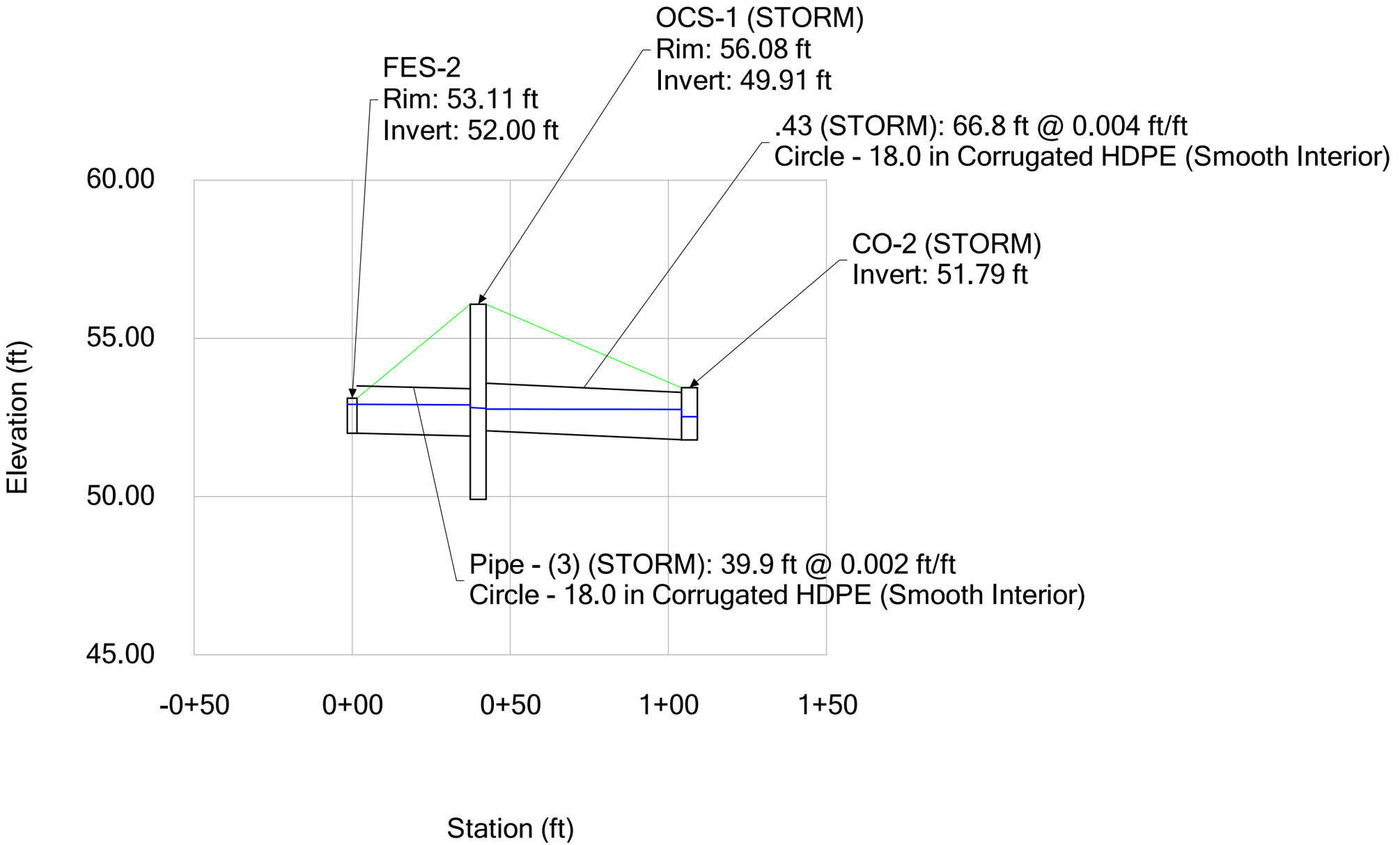


Profile Report
Engineering Profile - CO-1 (STORM) to O-1 (C-CALC-2102412-Proposed Hydraulics.stsw)



Profile Report

Engineering Profile - FES-2 to CO-2 (STORM) (C-CALC-2102412-Proposed Hydraulics.stsw)



Conduit FlexTable: Hydraulic Grade Line Computations

Label	Start Node	Stop Node	Diameter (in)	Length (ft)	System Rational Flow (cfs)	Total System Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	EGL (In) (ft)	EGL (Out) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)
.43 (STORM)	OCS-1 (STORM)	CO-2 (STORM)	18.0	66.8	0.00	2.06	7.46	3.61	0.004	52.08	51.79	52.87	52.80	52.76	52.75	56.08	53.44
Pipe - (1) (STORM)	CB-1 (STORM)	CB-2 (STORM)	15.0	194.0	3.48	3.48	3.28	2.84	0.002	50.63	50.20	52.16	51.68	52.04	51.56	54.13	54.16
Pipe - (2) (STORM)	CB-2 (STORM)	O-2	15.0	25.6	4.39	4.39	3.38	3.58	0.002	50.10	50.04	51.38	51.27	51.13	50.89	54.16	51.15
Pipe - (3) (STORM)	FES-2	OCS-1 (STORM)	18.0	39.9	0.00	2.06	5.41	2.85	0.002	52.00	51.91	52.96	52.94	52.91	52.90	53.11	56.08
Pipe - (8) (STORM)	CO-3 (STORM)	O-1	18.0	36.4	1.53	3.59	7.46	4.18	0.004	51.44	51.28	52.44	52.29	52.17	52.01	53.09	52.93
Pipe - (9) (STORM)	CO-2 (STORM)	CO-3 (STORM)	18.0	80.6	1.56	3.62	7.46	4.19	0.004	51.79	51.44	52.80	52.45	52.53	52.17	53.44	53.09
Pipe - (10) (STORM)	CO-1 (STORM)	CO-2 (STORM)	12.0	130.3	1.61	1.61	2.73	3.62	0.005	52.44	51.79	53.20	52.80	52.99	52.73	53.19	53.44

APPENDIX E

Water Quality Calculations

Water Quality Calculations

Determine Water Quality Volume

From CT 2004 Stormwater Quality Manual:

$$WQV = \frac{(1")(R)(A)}{12}$$

$$R = 0.05 + 0.009(I)$$

WQV = water quality volume (ac-ft)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area in acres
WQv = Calculated Water Quality Volume

Area		Total Area		Impervious Area		Impervious Cover	Volumetric Runoff Coefficient	Water Quality Volume (WQV)			
ID		ac	ft^2	ac	ft^2	%	R	acre-feet	ft^3	Proposed Water Quality Volume (WQV)	
PDA-300	PDA-300	3.198	139,303	0.738	32,128	23.08	0.258	0.069	3,006	acre-feet	ft^3
TOTAL		3.198	139,303	0.738	32,128	23.08	0.258	0.069	3,006	0.352	15,352

*The Proposed Water Quality Volume (WQV) is calculated at the available storage depth below the lowest orifice

Water Quality Calculations- CT General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities

Determine Water Quality Volume

From CT 2004 Stormwater Quality Manual:

$$WQV = \frac{(1'')(R)(A)}{12}$$

$$R = 0.05 + 0.009(I)$$

WQV = water quality volume (ac-ft)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area in acres
WQv = Calculated Water Quality Volume

Area		Total Area		Impervious Area		Impervious Cover	Volumetric Runoff Coefficient	Water Quality Volume (WQV)			
ID		ac	ft^2	ac	ft^2	%	R	acre-feet	ft^3		
PDA-100	PDA-100	2.614	113,882	0.446	19,435	17.06	0.204	0.044	1,917		
PDA-200	PDA-200	0.591	25,738	0.154	6,689	26.06	0.285	0.014	610		
PDA-300	PDA-300	3.443	149,998	0.983	42,823	28.55	0.307	0.088	3,833	Proposed Water Quality Volume (WQV)	
TOTAL SITE		6.648	289,618	1.583	68,947	23.81	0.264	0.146	6,360	0.352	15,352

*The Proposed Water Quality Volume (WQV) is calculated at the available storage depth below the lowest orifice

Water Quality Calculations

Determine Water Quality Flow

From CT 2004 Stormwater Quality Manual:

$$CN = \frac{1000}{\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{\frac{1}{2}}\right]}$$

$$Q = \frac{[WQV\,(acre - feet) \times [12(inches\,/\,foot)]]}{DrainageArea(acres)}$$

$$WQF = (q_u)(A)(Q)$$

CN = Runoff Curve Number
P = design preciptation, inches, (1" for water quality storm)
Q = runoff depth (in watershed inches)
T_c = time of concentration
I_a = Initial abstraction, inches, from Table 4-1, Chapter 4, TR-55
q_u = unit peak discharge,
WQF = water quality flow (cfs)

WQ Treatment Device	Facility ID	Total Area ft^2	Total Area ac	Total Area mi^2	Imp Area ft^2	Imp Area ac	Imp Cover %	R -	WQV acre-feet	Q in	P in	CN -	T_c mins	T_c hours	I_a in	I_a/P -	q_u [1] $cfs/mi^2/in$	WQF cfs
Hydrodynamic Separator HDS-1	PDA-300	139,303	3.198	0.0050	32,128	0.738	23.08	0.258	0.069	0.26	1.00	88	12.8	0.21	0.273	0.273	500	0.65

1 From Exhibit 4-III: Unit peak discharge (q_u) for SCS type III rainfall distribution, Urban Hydrology for Small Watersheds (TR-55), USDS< SCS, June 1986.

Groundwater Recharge Volume Calculations

Groundwater Recharge Volume

From CT 2004 Stormwater Quality Manual:

$$GVR = \frac{(D)(A)(I)}{12}$$

GRV Groundwater Recharge Volume (ac-ft)
D = Depth of Runoff to be Recharged (table 7-4)
A = site area in acres
I = impervious cover (decimal)

	A					I										
	Total Site Area (AC)	Site Area by NRCS Hydrologic Soil Group				Impervious Cover by NRCS Hydrologic Soil Group				Site Imperviousness (Decimel) by NRCS Hydrologic Soil Group				GRV Required (ac-ft)	Provided Recharge Volume (ac-ft) (Undeground Detention Only)	Req. Meet
		A	B	C	D	A	B	C	D	A	B	C	D			
Existing	6.65	0.00	2.57	0.00	4.07	0.00	0.35	0.00	0.27	0.00	0.14	0.00	0.07	-0.007	-	-
Proposed	6.65	0.00	2.57	0.00	4.07	1.00	1.17	1.00	0.42	0.00	0.45	0.00	0.10	0.024	0.352	YES
														0.0171	0.352	YES

Table 7-4
Groundwater Recharge Depth

NRCS Hydrologic Soil Group	Average Annual Recharge	Groundwater Recharge Depth (D)
A	18 inches/year	0.4 inches
B	12 inches/year	0.25 inches
C	6 inches/year	0.10 inches
D	3 inches/year	0 inches (waived)

Source: MADEP, 1997.
NRCS – Natural Resources Conservation Service

Best Management Practice (BMP) Treatment Train Efficiency Worksheet

Prepared for:
Proposed Retail Development
1682 & 1686 CT Route 12
Gales Ferry, Connecticut

Prepared by:
BL Companies
100 Constitution Plaza, 10th Floor
Hartford, CT

Date prepared:
July 17, 2022

Overall Site Treatment Train Efficiency to Underground Stormwater Detention System

Et=[1-(1-E1)(1-E2)(1-E3)(1-E4)(1-E?)]*100

BMP	BMP Description	Type pf Treatment	Efficiency Rate %
E1	Impervious Surface Sweeping***	secondary (conventional)	10
E2	Deep Sump and Hooded Catch Basin	Primary	25
E3	Hydrodynamic Separator**	Primary	80
E4	Infiltration Basin	Primary	80

Overall Treatment Train Efficiency (Et)= 97 % Total Suspended Solids (TSS) Removal

* 80% required per CT DEEP
** Manufacturer Claims 80% TSS Removal
*** Schueler 1996 & EPA 1993

TSS Removal Rates (adapted from Schueler, 1996, & EPA, 1993)

BMP List	Design Rate	Range of Average TSS Removal Rates	Brief Design Requirements
Extended Detention Pond	70%	60-80%	Sediment forebay
Wet Pond (a)	70%	60-80%	Sediment forebay
Constructed Wetland (b)	80%	65-80%	Designed to infiltrate or retain
Water Quality Swale	70%	60-80%	Designed to infiltrate or retain
Infiltration Trench	80%	75-80%	Pretreatment critical
Infiltration Basin	80%	75-80% (predicted)	Pretreatment critical
Dry Well	80%	80% (predicted)	Rooftop runoff
			(uncontaminated only)
Sand Filter (c)	80%	80%	Pretreatment
Organic Filter (d)	80%	80%+	Pretreatment
Water Quality Inlet	25%	15-35% w/ cleanout	Off-line only; 0.1" minimum Water Quality Volume (WQV) storage
Sediment Trap (Forebay)	25%	25% w/ cleanout	Storm flows for 2-year event must not cause erosion; 0.1" minimum WQV storage
Drainage Channel	25%	25%	Check dams; non-erosive for 2-yr.
Deep Sump and Hooded Catch Basin	25%	25% w/ cleanout	Deep sump general rule = 4 x pipe diameter or 4.0' for pipes 18" or less
Street Sweeping	10%	10%	Discretionary non-structural credit, must be part of approved plan

TABLE 2 - PERFORMANCE MATRIX FOR CTDOT QUALIFIED HYDRODYNAMIC SEPARATORS

Max WQF (cfs)	Product Model									
	Barracuda	***Cascade***	***CDS***	***Concentrator***	***Downstream Defender***	***DVS***	***First Defense***	***HydroStorm***	***SciClone***	***Xcelerator***
0.1	Barracuda S3(3)	CS-3(3)	CDS-3(3)	AS-2(2.5)	4ft(4)	DVS-36(3)	3ft(3)	HS3(3)	SC-3(3)	XC-2(2.5)
0.2	Barracuda S3(3)	CS-3(3)	CDS-3(3)	AS-2(2.5)	4ft(4)	DVS-36(3)	3ft(3)	HS3(3)	SC-3(3)	XC-2(2.5)
0.3	Barracuda S3(3)	CS-3(3)	CDS-3(3)	AS-2(2.5)	4ft(4)	DVS-36(3)	3ft(3)	HS3(3)	SC-3(3)	XC-2(2.5)
0.4	Barracuda S3(3)	CS-3(3)	CDS-3(3)	AS-3(3.5)	4ft(4)	DVS-36(3)	3ft(3)	HS3(3)	SC-4(4)	XC-2(2.5)
0.5	Barracuda S3(3)	CS-3(3)	CDS-3(3)	AS-3(3.5)	4ft(4)	DVS-36(3)	3ft(3)	HS3(3)	SC-4(4)	XC-2(2.5)
0.6	Barracuda S3(3)	CS-3(3)	CDS-4(4)	AS-3(3.5)	4ft(4)	DVS-48(4)	3ft(3)	HS4(4)	SC-4(4)	XC-3(3.5)
0.7	Barracuda S3(3)	CS-3(3)	CDS-4(4)	AS-3(3.5)	4ft(4)	DVS-48(4)	3ft(3)	HS4(4)	SC-4(4)	XC-3(3.5)
0.8	Barracuda S4(4)	CS-3(3)	CDS-4(4)	AS-4(4.5)	4ft(4)	DVS-48(4)	3ft(3)	HS4(4)	SC-5(5)	XC-3(3.5)
0.9	Barracuda S4(4)	CS-3(3)	CDS-4(4)	AS-4(4.5)	4ft(4)	DVS-48(4)	4ft(4)	HS5(5)	SC-5(5)	XC-3(3.5)
1.0	Barracuda S4(4)	CS-3(3)	CDS-5(5)	AS-4(4.5)	4ft(4)	DVS-48(4)	4ft(4)	HS5(5)	SC-5(5)	XC-3(3.5)
1.1	Barracuda S4(4)	CS-4(4)	CDS-5(5)	AS-4(4.5)	4ft(4)	DVS-60(5)	4ft(4)	HS5(5)	SC-6(6)	XC-3(3.5)
1.2	Barracuda S4(4)	CS-4(4)	CDS-5(5)	AS-5(5)	6ft(6)	DVS-60(5)	4ft(4)	HS5(5)	SC-6(6)	XC-4(4.5)
1.3	Barracuda S5(5)	CS-4(4)	CDS-5(5)	AS-5(5)	6ft(6)	DVS-60(5)	4ft(4)	HS5(5)	SC-6(6)	XC-4(4.5)
1.4	Barracuda S5(5)	CS-4(4)	CDS-5(5)	AS-5(5)	6ft(6)	DVS-60(5)	4ft(4)	HS6(6)	SC-6(6)	XC-4(4.5)
1.5	Barracuda S5(5)	CS-4(4)	CDS-5(5)	AS-6(6)	6ft(6)	DVS-60(5)	4ft(4)	HS6(6)	SC-6(6)	XC-4(4.5)
1.6	Barracuda S5(5)	CS-4(4)	CDS-6(6)	AS-6(6)	6ft(6)	DVS-72(6)	5ft(5)	HS6(6)	SC-7(7)	XC-4(4.5)
1.7	Barracuda S5(5)	CS-4(4)	CDS-6(6)	AS-6(6)	6ft(6)	DVS-72(6)	5ft(5)	HS6(6)	SC-7(7)	XC-4(4.5)
1.8	Barracuda S5(5)	CS-4(4)	CDS-6(6)	AS-6(6)	6ft(6)	DVS-72(6)	5ft(5)	HS6(6)	SC-7(7)	XC-4(4.5)

Stage-Area-Storage for Pond P1: Stormwater Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
48.00	1,605	0
48.10	1,679	164
48.20	1,754	336
48.30	1,828	515
48.40	1,903	702
48.50	1,977	896
48.60	2,051	1,097
48.70	2,126	1,306
48.80	2,200	1,522
48.90	2,275	1,746
49.00	2,349	1,977
49.10	2,429	2,216
49.20	2,509	2,463
49.30	2,589	2,718
49.40	2,669	2,981
49.50	2,750	3,252
49.60	2,830	3,531
49.70	2,910	3,818
49.80	2,990	4,113
49.90	3,070	4,416
50.00	3,150	4,727
50.10	3,236	5,046
50.20	3,321	5,374
50.30	3,407	5,710
50.40	3,492	6,055
50.50	3,578	6,409
50.60	3,664	6,771
50.70	3,749	7,141
50.80	3,835	7,520
50.90	3,920	7,908
51.00	4,006	8,305
51.10	4,097	8,710
51.20	4,189	9,124
51.30	4,280	9,547
51.40	4,371	9,980
51.50	4,463	10,422
51.60	4,554	10,872
51.70	4,645	11,332
51.80	4,736	11,801
51.90	4,828	12,280
52.00	4,919	12,767
52.10	5,016	13,264
52.20	5,113	13,770
52.30	5,210	14,286
52.40	5,307	14,812
52.50	5,404	15,348
52.60	5,501	15,893
52.70	5,598	16,448
52.80	5,695	17,013
52.90	5,792	17,587
53.00	5,889	18,171
53.10	5,992	18,765
53.20	6,094	19,369
53.30	6,197	19,984
53.40	6,299	20,609
53.50	6,402	21,244
53.60	6,505	21,889
53.70	6,607	22,545
53.80	6,710	23,211
53.90	6,812	23,887
54.00	6,915	24,573
54.10	7,023	25,270
54.20	7,132	25,978
54.30	7,240	26,696
54.40	7,348	27,426
54.50	7,457	28,166
54.60	7,565	28,917
54.70	7,673	29,679
54.80	7,781	30,452
54.90	7,890	31,235
55.00	**7,998**	**32,030**

WQV and Groundwater Recharge Volume provided below outlet 15,348 CF

APPENDIX F

Drainage Maps

ED-1 – Existing Drainage Map
PD-1 – Proposed Drainage Map
PD-2 – Proposed Drainage Map

EXISTING HYDROLOGY LEGEND

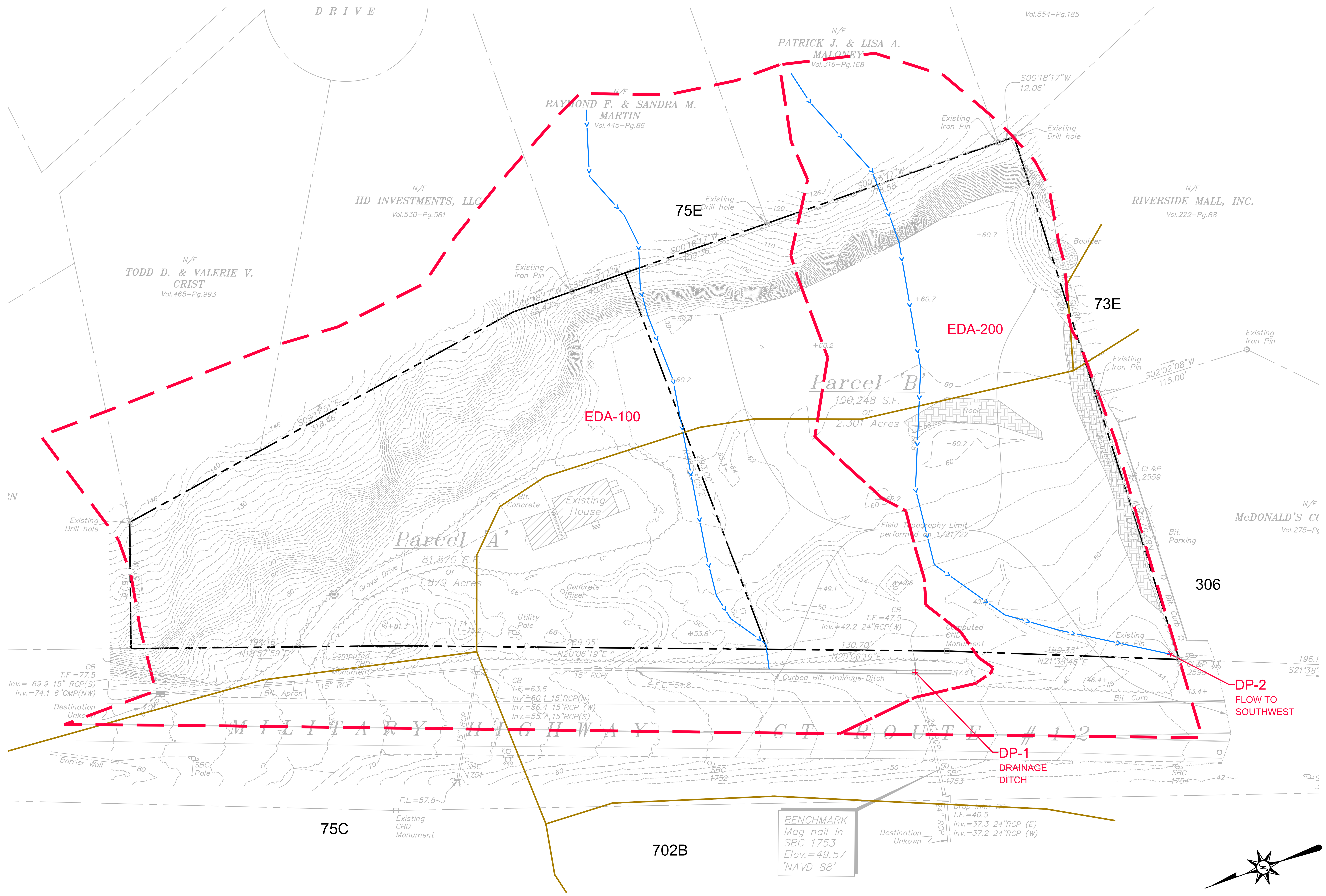
- PROPERTY LINE
- EXISTING SOIL BOUNDARY
- EXISTING DRAINAGE BOUNDARY
- EXISTING TIME OF CONCENTRATION
- EDA-200 — EXISTING DRAINAGE AREA ID
- DP-2 — EXISTING DESIGN POINT

SOIL TYPE LEGEND

- 73E — CHARLTON–CHATFIELD COMPLEX 15–45% SLOPES, VERY ROCKY
- 75C — HOLLIS–CHATFIELD–ROCK OUTCROP COMPLEX 3–15% SLOPES
- 75E — HOLLIS–CHATFIELD–ROCK OUTCROP COMPLEX 15–45% SLOPES
- 306 — UDORTHENTS–URBAN LAND COMPLEX

EXISTING HYDROLOGY SUMMARY TABLE

DRAINAGEA AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATIONS (MIN.)
EDA-100	195,104	19,861	175,243	10.2%	78	14.3
EDA-200	81,971	0	81,971	0.0%	70	14.6



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BL Companies
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10th Floor
Hartford, CT 06103
(860) 249-2200
(860) 249-2400 Fax

PROPOSED RETAIL DEVELOPMENT
1682 & 1686 CT ROUTE 12
GALES FERRY, CONNECTICUT

REVISIONS

No.	Date	Desc.

Designed	T.R.J.
Drawn	T.R.J.
Reviewed	
Scale	1"=40'
Project No.	2102412
Date	08/01/2022
CAD File:	ED210241201

Title
EXISTING DRAINAGE MAP

Sheet No.
ED-1

Xref (s): ; XZ210241201 ; BD210241201 ; XC210241211

PROPOSED HYDROLOGY LEGEND

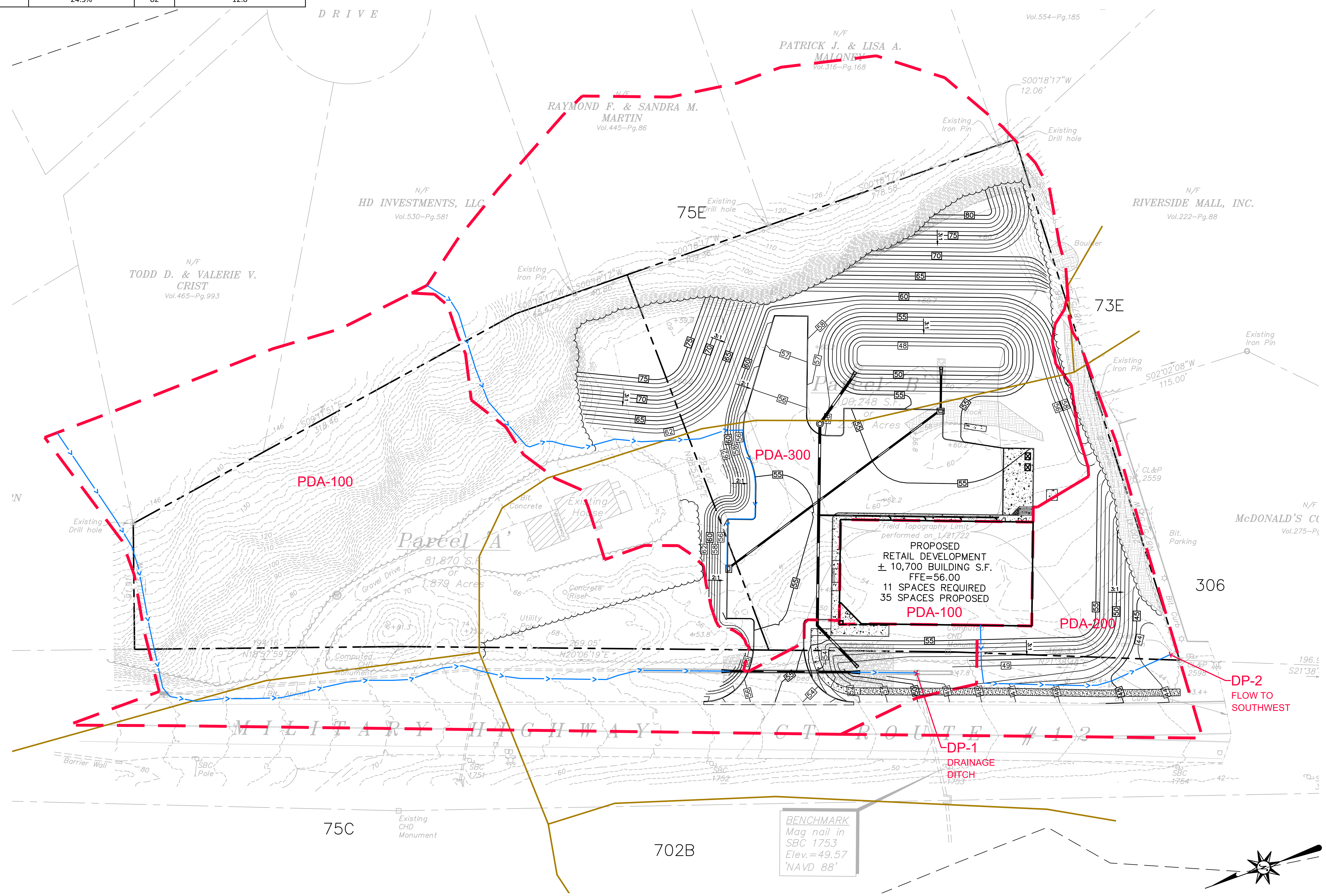
- PROPERTY LINE
- PROPOSED SOIL BOUNDARY
- PROPOSED DRAINAGE BOUNDARY
- PROPOSED TIME OF CONCENTRATION
- PDA-200 — PROPOSED DRAINAGE AREA ID
- DP-2 — PROPOSED DESIGN POINT

SOIL TYPE LEGEND

73E	CHARLTON-CHATFIELD COMPLEX 15-45% SLOPES, VERY ROCKY
75C	HOLLIS-CHATFIELD-ROCK OUTCROP COMPLEX 3-15% SLOPES
75E	HOLLIS-CHATFIELD-ROCK OUTCROP COMPLEX 15-45% SLOPES
306	UDORTHENTS-URBAN LAND COMPLEX

PROPOSED HYDROLOGY SUMMARY TABLE

DRAINAGEA AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATIONS (MIN.)
PDA-100	124,577	30,130	94,447	24.2%	80	19.1
PDA-200	25,738	6,689	19,049	26.0%	71	8.7
PDA-300	139,303	33,862	105,441	24.3%	82	12.8



GRAPHIC SCALE

40 20 0 40

SCALE IN FEET

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Engineering
Environmental
Land Surveying

BL Companies

100 Constitution Plaza
10th Floor
Hartford, CT 06103
(860) 249-2200
(860) 249-2400 Fax

PROPOSED RETAIL DEVELOPMENT

1682 & 1686 CT ROUTE 12
GALES FERRY, CONNECTICUT

REVISIONS

No.	Date	Desc.

Designed	T.A.H.
Drawn	T.A.H.
Reviewed	
Scale	1"=40'
Project No.	2102412
Date	08/01/2022
CAD File:	PD210241201

Title

PROPOSED DRAINAGE MAP

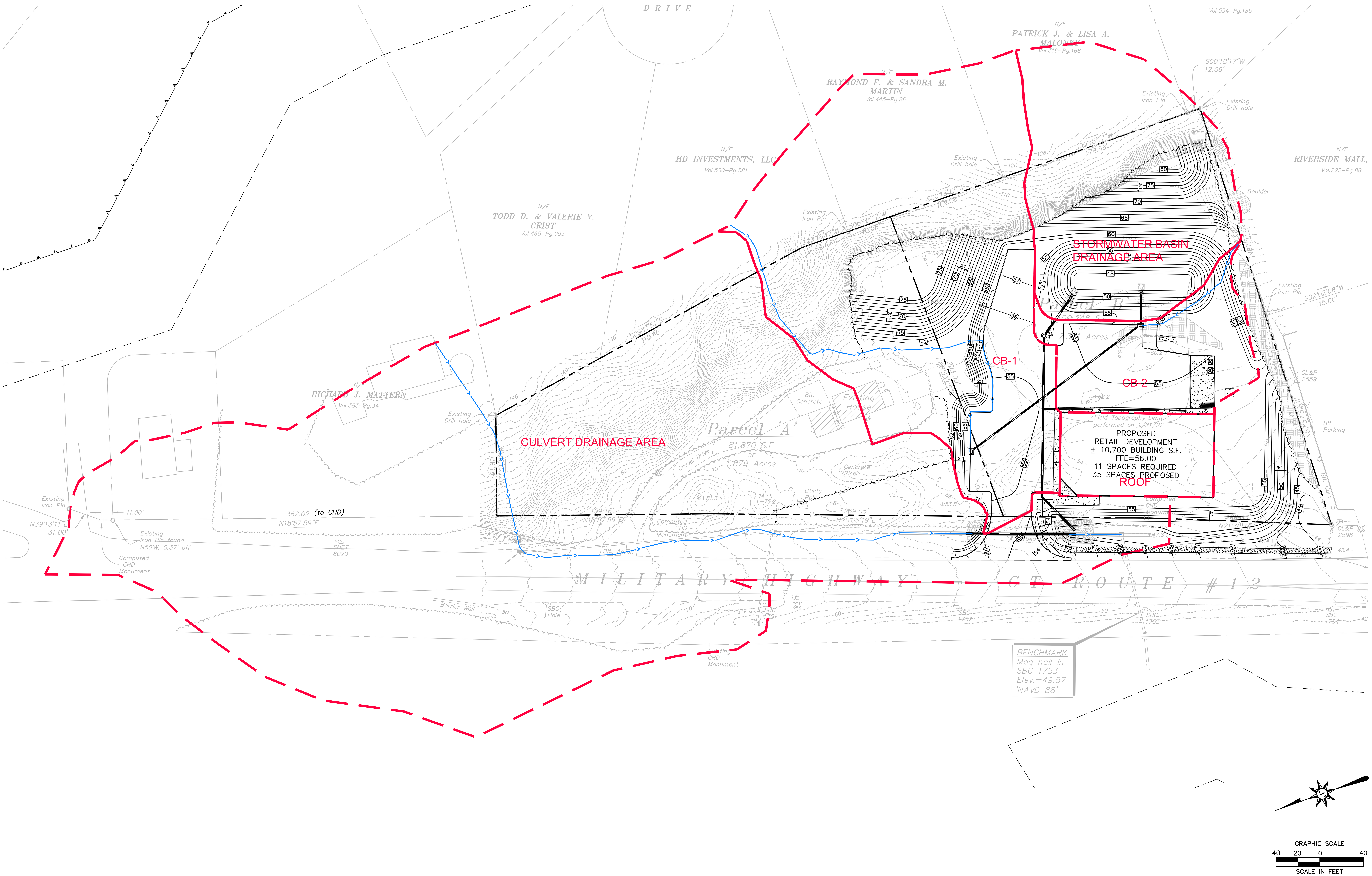
Sheet No.

PD-1

Xref (s): ; XZ210241201 ; BD210241201 ; XC210241201 ; XC210241211 ; XC210241212 ; XC210241201 ; XC210241202

PROPOSED HYDROLOGY LEGEND

(line symbol)	PROPERTY LINE
(line symbol)	PROPOSED DRAINAGE BOUNDARY
(line symbol)	PROPOSED TIME OF CONCENTRATION
PDA-200	PROPOSED DRAINAGE AREA ID



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PROPOSED RETAIL DEVELOPMENT
1682 & 1686 CT ROUTE 12
GALES FERRY, CONNECTICUT

REVISIONS		
No.	Date	Desc.

Designed	T.A.H.
Drawn	T.A.H.
Reviewed	
Scale	1"=40'
Project No.	2102412
Date	08/01/2022
CAD File:	PD210241202

Title
PROPOSED DRAINAGE MAP

Sheet No.
PD-2

Xref (s): ; XZ210241201 ; BD210241201 ; XC210241201 ; XC210241211 ; XC210241212 ; XC210241201 ; XC210241202

APPENDIX G

Geotechnical Report

Custom Soil Resource Report For State Of Connecticut

WHITESTONE
An Employee-Owned Company

16 OLD FORGE ROAD
SUITE A
ROCKY HILL, CT 06067
860.726.7889
whitestoneassoc.com

April 7, 2022

via email

GARRETT HOMES, LLC
59 Field Street
Torrington, Connecticut 06790

Attention: Mr. Gary W. Eucalitto
Principal

Regarding: LIMITED GEOTECHNICAL INVESTIGATION
PROPOSED RETAIL DEVELOPMENT
1682 CONNECTICUT ROUTE 12
MAP 33, BLOCK 34, PORTION OF LOT 2
GALES FERRY, NEW LONDON COUNTY, CONNECTICUT
WHITESTONE PROJECT NO.: GM2218961.000

Dear Mr. Eucalitto:

Whitestone Associates, Inc. (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The results of the investigation and recommendations presented below are based on the soil conditions disclosed from a limited number of soil borings conducted during Whitestone's field investigation. The purpose of the investigation was to assess subsurface conditions within and adjacent to the proposed building area accessible to an all terrain vehicle mounted drill rig. Recommendations for support of the proposed structure and pavement and anticipated earthwork requirements are included herein.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The subject property is located at 1682 Connecticut Route 12 in Gales Ferry, New London County, Connecticut. The site currently is undeveloped and wooded.

1.2 Site Geology

Based on a review of the *Surficial Materials Map of Connecticut (1992)*, the site is primarily underlain by glacial till. The mapped boundary of a glaciofluvial deposit (sand and gravel) is on the southern side of the site. A significant thickness of existing fill was encountered in the borings. The *Bedrock Geologic Map of Connecticut (1985)* indicates that the northern portion of the subject property is underlain by the Proterozoic Z-age porphyritic phase of Potter Hill Granite Gneiss, consisting of gneiss, and the southern portion by the Proterozoic Z-age Plainfield Formation, consisting of quartzite with minor schist and gneiss, and incidental calc-silicate rock and amphibolite, both part of the Eastern Uplands; Avalonian (Continental) Terrane; Avalonian Anticlinorium.

1.3 Proposed Construction

Based on a March 7, 2022 *Test Pit Plan*, prepared by BL Companies, Inc. of Meriden, Connecticut, the proposed development will include the construction of a retail store with a footprint of approximately 9,500 square feet, new pavements, and utilities. Access will be from Connecticut Route 12. The location is shown on attached Figure 1 - *Boring Location Plan*.

The proposed building is anticipated to be a single-story, masonry and metal-framed structure with a ground-supported floor slab and no basement or crawl space. Whitestone understands that site grading will lower the site by around 10 feet. A subsurface stormwater management system is planned to the south of the store. No new retaining walls are indicated.

Detailed structural information was not available at the time of this report, however, based on experience with similar facilities, Whitestone anticipates that maximum column, wall, and floor loads will be less than about 50 kips, 2.0 kips per lineal foot, and 150 pounds per square foot, respectively.

2.0 FIELD EXPLORATION & TESTING

2.1 Field Exploration

Field exploration at the project site consisted of advancing 10 soil borings (identified as B-1 through B-10) within accessible portions of the site. The explorations subsequently were backfilled to the surface with excavated soils from the investigation. The locations of the explorations are shown on the accompanying *Boring Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone engineer, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Infiltration Testing

An infiltration test, I-1, was conducted as a falling head test in a cased hole at the location shown on the *Boring Location Plan*. Steel casing, four inches in diameter, was installed to a depth of 9.8 fbgs. The soil was pre-soaked for two hours. Following testing, the casing was removed. The results are tabulated below.

SUMMARY OF INFILTRATION TESTING						
Location	**Ground Elevation (ft)**	**Test Depth (fbgs)**	**Test Elevation (ft)**	**Infiltration Rate (in/hr)**		
				Hour 1	**Hour 2**	**Hour 3**
I-1 (B-8)	± 51	9.8	± 41	2.0	1.8	1.8

Whitestone recommends that the unfactored infiltration rate not exceed 1.8 inches per hour and that a Factor of Safety of at least 2.5 be applied to the rate for design purposes.

A similar infiltration test was attempted at the location of boring B-7 at a depth of four fbgs within the blast rock fill, however, water was drained immediately from the borehole. As such, the test could not be performed.

3.0 SUBSURFACE CONDITIONS

The subsurface soil conditions encountered within the subsurface tests conducted by Whitestone consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover Materials: The borings encountered two inches to six inches of topsoil or forest mat at the ground surface.

Existing Fill: Beneath the surface cover materials, the borings encountered very loose to very dense existing fill. The existing fill consists of significant amounts of blast rock, with portions consisting of silty sand with gravel and cobbles. Organic material (possibly former topsoil) was encountered mixed with the fill in borings B-5 and B-6. Concrete obstructions were also encountered. The recovered material in the small diameter, split spoon sampler does not provide an accurate indication of the individual particle sizes in such fill material. The SPT N-values within the existing fill were variable, ranging from two blows per foot (bpf) to 72 bpf, with several split spoon sampler driving refusals. Where penetrated, the existing fill extended to depths of eight fbgs to 17 fbgs. Borings B-1, B-2, B-5, B-6, and B-7 terminated upon auger refusal in this stratum at depths of four fbgs to 16 fbgs. Auger refusal likely was encountered due to larger pieces of blast rock or boulders. The existing fill conditions are considered variable. The attached boring logs provide more detail.

Glacial Till: Beneath the existing fill, borings B-3, B-4, B-8, B-9, and B-10 encountered glacial till, consisting of brown, dense to very dense, silty sand with gravel and cobbles (USCS: SM). The SPT N-values within the glacial till were variable, ranging from 30 bpf to 76 bpf. Borings B-3, B-8, B-9, and B-10 terminated in this stratum at depths of 10 fbgs to 17 fbgs.

Apparent Bedrock: Boring B-4 encountered auger refusal on apparent bedrock at a depth of 24.5 fbgs. The refusal materials were not sampled through rock coring efforts, but were inferred by refusal of the hollow stem augers. Rock coring techniques would be required to further characterize the nature and

extent of the refusal materials.

Groundwater: Groundwater was encountered in the soil borings during the exploration at depths of 13.5 fbgs to 16 fbgs. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

4.0 CONCLUSIONS & RECOMMENDATIONS

Contingent upon construction phase evaluation after site grading has removed approximately 10 feet of the existing fill, Whitestone's findings indicate that the proposed building may be supported on conventional shallow foundations bearing on the approved glacial till and/or structural fill placed on the glacial till. Existing fill was encountered up to a depth of 17 fbgs in the borings, and as such, overexcavation under footings to this depth or deeper and replacement with structural fill will likely be required. Deeper fill may be encountered between the widely spaced borings. A ground-supported floor slab may derive support from the inspected, approved, and improved existing fill or glacial till, and/or controlled structural fill materials. Additionally, the site conditions support the use of typical pavement sections using standard CTDOT specified materials.

Organic material was encountered mixed with the existing fill in two borings. Similar organic material may be present directly beneath or within the lower portion of the blast rock fill throughout the site. If significant pockets of organic material are encountered within or below the blast rock fill during foundation excavation, the organic material should be "chased out" below the floor slab.

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered within the limited exploration conducted. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, Whitestone should be consulted, such that the recommendations of this report can be reviewed.

4.1 Site Preparation & Earthwork

Surface Preparation: Prior to placing granular subbase after grading is complete, the exposed soils should be compacted to a firm and unyielding surface with several passes in two perpendicular directions of a minimum 10-ton vibratory compactor. The surface should then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be conducted after a suitable period of dry and non-freezing weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be started during the winter months, Whitestone should be contacted for alternate surface preparation procedures. Fill and backfill should be placed and compacted in accordance with Section 4.2.

Excavation Difficulties: Larger pieces of blast rock fill, concrete obstructions in the existing fill, and cobbles and boulders typically encountered in the glacial till will likely present excavation difficulties within the depth of proposed excavation. Excavation difficulties will be affected by the depth and extent of the excavation. The speed and ease of excavation also will depend on the type of equipment used and the skill of the operator. Whitestone expects that the blast rock fill and glacial till will be removable with standard heavy excavation equipment, however, pneumatic hammers may be required to remove larger pieces of rock/boulders and concrete obstructions.

Weather Performance Criteria: Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 4.2 of this report may be required prior to resuming work on disturbed subgrade soils.

Subgrade Protection and Inspection: Every effort should therefore be made to reduce disturbance of the on-site soils by construction traffic and surface runoff. The contractor should be responsible for protection of subgrades and minimization of exposure of the site soils to precipitation by covering stockpiles and subgrades with plastic and preventing ponding of water by sealing subgrades before precipitation events and grading the site to allow proper drainage of surface water. The services of the geotechnical engineer should be retained to observe soil conditions during construction and review the suitability of prepared foundation subgrades for support of design loads.

Groundwater Control: Static groundwater was encountered during the exploration at depths below the proposed excavation depth for site grading. However, after site grading, static groundwater may impact foundation construction and excavation for utilities. In addition, shallower perched water may be encountered during construction above impermeable material elsewhere on the site. Construction phase dewatering may consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that such construction phase dewatering would typically include installing temporary sump pits and filtered pumps within trenches and excavations. Whitestone recommends that foundation construction occur during periods of relatively dry weather. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of foundation areas to precipitation.

4.2 Structural Fill & Backfill

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Soil Reuse: Whitestone anticipates that only a portion of the site soils will be structurally suitable for selective reuse as fill/backfill material, provided that soil moisture contents are controlled within three percent of optimum moisture level, particles larger than three inches in diameter are either removed or crushed, and objectionable portions, such as any organics, are segregated. The blast rock fill will require crushing before reuse. Portions of the site soils have a relatively high fines content. Prior to reuse, drying may be necessary or mixing with more granular materials. In addition, on-site soil reuse should not be attempted during inclement weather or in damp conditions. Reuse of the site soils will be contingent on careful review in the field by visual observation by the owner's geotechnical engineer during construction as recommended herein.

Compaction and Placement Requirements: Fill and backfill should be placed in maximum 8-inch loose lifts and compacted to 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor). Whitestone recommends using only a small hand-held vibratory compactor to compact the on-site soils within footing excavations.

4.3 Foundation Design Criteria

Foundations: Contingent upon construction phase evaluation, Whitestone preliminarily recommends supporting the proposed building on conventional shallow spread foundations designed to bear within the approved glacial till and/or on controlled structural fill materials that are properly placed and compacted as described herein. Site conditions should be reviewed following removal of the approximately 10 feet of existing fill that will be excavated to grade the site. Existing fill was encountered up to a depth of 17 fbgs in the borings, i.e., deeper than the proposed grading excavation, however, deeper fill may be encountered between the widely spaced borings. The existing fill below footings should be overexcavated and replaced with structural fill. Foundations bearing within these materials may be designed using a maximum net allowable bearing pressure of 4,000 pounds per square foot.

Foundation subgrades should be reviewed by the geotechnical engineer. Regardless of loading conditions, new foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Footings subject to lateral loads and/or overturning should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. An allowable coefficient of friction against sliding of 0.4 is recommended for use in the design of the foundations bearing within the existing site soils or imported structural fill soils.

Seismic Site Class: Based on a review of the subsurface conditions relevant to the *Connecticut State Building Code*, the subject site has been assigned a Site Class C. The site soils are not susceptible to earthquake induced liquefaction.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils at the footing bottoms be reviewed by a geotechnical engineer immediately prior to placing concrete for the footings. In the event that areas of unsuitable materials are encountered, additional overexcavation and replacement of the materials may be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least 1 foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grades are restored with lean concrete.

Frost Coverage: Footings subject to frost action should be placed at least 42 inches below adjacent exterior grades, in accordance with the *Connecticut State Building Code*, to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the floor slab subgrade, but should not be placed on existing fill.

Settlement: Whitestone estimates post construction settlements of proposed foundations of less than 1 inch, if the recommendations outlined in this report are properly implemented. Differential settlement of spread foundations should be less than ½ inch.

4.4 Floor Slab

Whitestone anticipates that the properly inspected, approved, and improved existing fill or glacial till, and/or compacted structural fill will be suitable for support of the proposed floor slab, provided these materials are properly evaluated, compacted, and proofrolled in accordance with the recommendations of this report during favorable weather conditions. If significant pockets of organic material are encountered within or below the blast rock fill during foundation excavation, the organic material should be "chased out" below the floor slab and replaced with structural fill before placing the granular base material and concrete. Areas that are, or become, softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum 12-inch layer of CTDOT *M.05.01 Processed Aggregate Base* (or approved equivalent) should be placed below the floor slab to provide a uniform granular base. A moisture vapor barrier should also be installed beneath the floor slab in accordance with flooring manufacturer's recommendations.

If blast rock fill is exposed at floor slab subgrade level, a robust geotextile separation fabric (Mirafi RS280i, or similar) should be laid over the blast rock fill before placing the processed aggregate base. The fabric will reduce the likelihood of the finer portions of the processed aggregate base migrating into voids in the blast rock fill.

4.5 Pavement Design

Whitestone anticipates that the properly inspected, approved, and improved existing fill or glacial till, and/or compacted structural fill and/or backfill placed to raise or restore design elevations will be suitable for support of the proposed pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with the recommendations in this report during favorable weather conditions.

If blast rock fill is exposed at pavement subgrade level, a robust, geotextile separation fabric (Mirafi RS280i, or similar) should be laid over the blast rock fill before placing the granular subbase course of the pavement section. The fabric will reduce the likelihood of the finer portions of the granular base and subbase migrating into voids in the blast rock fill.

A California Bearing Ratio value of 8.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to a prepare flexible pavement design per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 15,000 ESALs and 30,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

Pavement components should meet material specifications from CTDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	**Material**	**Standard-Duty Thickness (inches)**	**Heavy-Duty Thickness (inches)**
Asphalt Wearing Course	CTDOT HMA S0.375 (Superpave); PG 64S-22	1.5	1.5
Asphalt Binder Course	CTDOT HMA S0.5 (Superpave); PG 64S-22	1.5	2.5
Granular Base	CTDOT M.05.01 Processed Aggregate Base	6.0	6.0
Granular Subbase	CTDOT M.02.02 Subbase; M.02.06 Gradation A	6.0	6.0

Rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at ingress/egress locations and the trash enclosure. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (inches)**
Surface	4,000 psi Air-Entrained Concrete	6.0 [1]
Granular Base	CTDOT M.05.01 Processed Aggregate Base	6.0
Granular Subbase	CTDOT M.02.02 Subbase; M.02.06 Gradation A	6.0

[1] The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of 6-inch by 6-inch W5.4/W5.4 welded wire fabric (ASTM A185).

The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill should be placed, compacted, and evaluated in accordance with the recommendations of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control. Drainage requirements should be further evaluated following site grading when the site has been lowered by around 10 feet.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that CTDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

4.6 Excavations

The existing fill and glacial till encountered during this investigation typically are, at a minimum, consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA), which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented.

5.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that any encountered underground structures are properly backfilled and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer. Site drainage requirements should be further evaluated following grading when the site has been lowered by around 10 feet.

6.0 CLOSING

Whitestone's Geotechnical Division appreciates the opportunity to be of continuing service to Garrett Homes, LLC. Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein. Please contact us with any questions regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Richard W.M. McLaren, P.E.
Senior Consultant

Ryan R. Roy, P.E.
Vice President

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Enclosures
Copy: Laurence W. Keller, P.E., Whitestone Associates, Inc.

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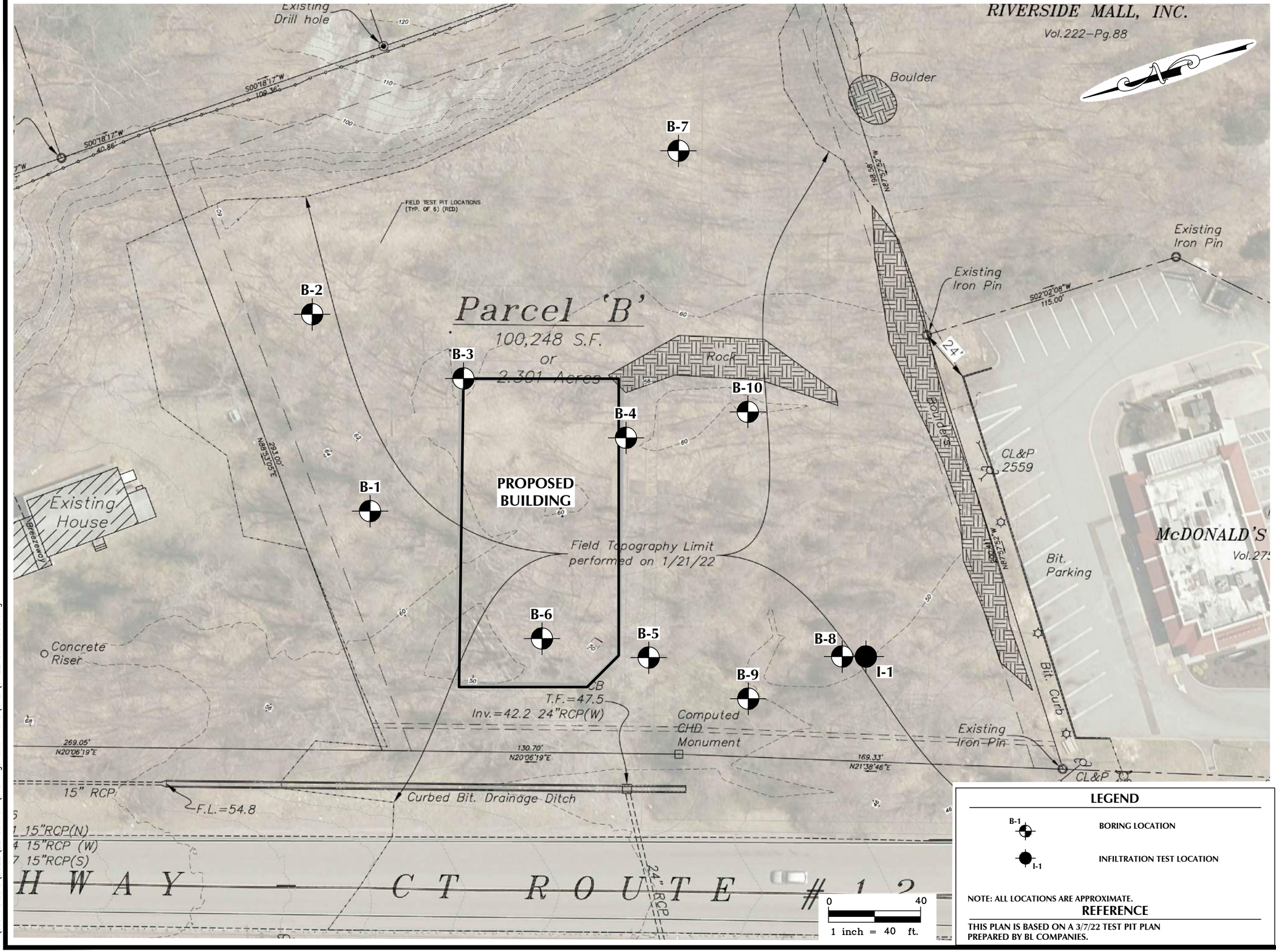
FIGURE 1
Boring Location Plan



LEGEND

B-1 — BORING LOCATION

I-1 — INFILTRATION TEST LOCATION

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON A 3/7/22 TEST PIT PLAN PREPARED BY BL COMPANIES.

WHITESTONE
An Employee-Owned Company
16 OLD FORGE ROAD, SUITE A, ROCKY HILL, CT 06067
860.726.7889 WHITESTONEASSOC.COM

DRAWING TITLE: **PROPOSED BORING LOCATION PLAN**

CLIENT: **GARRETT HOMES, LLC**

PROJECT:
PROPOSED RETAIL BUILDING
1682 CONNECTICUT ROUTE 12
PARCEL NO.: 76-2120-1682
GALES FERRY, NEW LONDON COUNTY, CONNECTICUT

PROJECT #: GM2218961.000	
DESIGNED BY: MR	PROJ. MGR.: RR
DATE: 3/31/22	FIGURE: 1
SCALE: 1" = 40'	

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APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/25/2022
Termination Depth:	11.8 feet bgs	**Date Completed:**	3/25/2022
Proposed Location:	Parking	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1		2 - 6 - 6 - 7	10	12				Brown to Dark Brown, Medium Dense, Silty Sand with Gravel, Concrete Pieces (FILL)	
2 - 4	S-2		7 - 5 - 5 - 10	8	10				As Above, Loose to Medium Dense (FILL)	
						5.0				
5 - 7	S-3		9 - 5 - 6 - 5	12	11		EXISTING FILL		As Above, Gray-Brown, Medium Dense (FILL)	
7 - 9	S-4		6 - 14 - 4 - 5	10	18				As Above (FILL)	Grinding below 8 fbgs Larger rock pieces
						10.0				
10 - 11.3	S-5		18 - 26 - 50/3"	10	52				As Above, Very Dense (FILL)	Cobbles
									Boring Log B-1 Terminated upon Auger Refusal at Depth of 11.8 fbgs.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/25/2022
Termination Depth:	11.0 feet bgs	**Date Completed:**	3/25/2022
Proposed Location:	Parking	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				Blast rock at surface
							TS		2" Forest Mat	
0 - 1.8	S-1	X	15 - 17 - 15 - 50/4"	12	32		EXISTING FILL		Gray Brown, Dense, Silty Sand with Gravel (FILL)	
3 - 3.6	S-2	X	14 - 50/1"	3	-				As Above (FILL)	Cobbles
						5.0				
5 - 7	S-3	X	22 - 16 - 9 - 6	12	25				As Above, Medium Dense (FILL)	
7 - 9	S-4	X	13 - 33 - 10 - 8	8	43				As Above, Dense (FILL)	
						10.0				
10 - 10.8	S-5	X	18 - 50/3"	6	-				As Above (FILL)	Cobbles
									Boring Log B-2 Terminated upon Auger Refusal at Depth of 11 fbgs.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/21/2022
Termination Depth:	17.0 feet bgs	**Date Completed:**	3/21/2022
Proposed Location:	Building	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

	Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
During:	15.0	--		
At Completion:	14.0	--	**At Completion:** --	--
24 Hours:	--	--	**24 Hours:** --	--

Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
						0.0			
0 - 2	S-1		2 - 9 - 15 - 16	12	24		TS	6" Topsoil	
							EXISTING FILL	Gray-Brown, Medium Dense, Silty Sand with Gravel (FILL)	
2 - 4	S-2		12 - 9 - 14 - 18	20	23			As Above (FILL)	
						5.0			
5 - 7	S-3		26 - 38 - 34 - 35	16	72			Gray, Very Dense, Silty Sand with Gravel (FILL)	
7 - 7.8	S-4		35 - 50/3"	6	-			As Above (FILL)	Cobbles
						10.0			
10 - 12	S-5		6 - 7 - 6 - 8	3	13			As Above, Medium Dense (FILL)	
						15.0			
15 - 17	S-6		38 - 19 - 34 - 42	0	53		GLACIAL TILL	No Recovery. Very Dense	
						20.0		Boring Log B-3 Terminated at Depth of 17 feet below ground surface. Split spoon sampler lost in hole.	
						25.0			

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/21/2022
Termination Depth:	24.5 feet bgs	**Date Completed:**	3/21/2022
Proposed Location:	Building	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	16.0 | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		3" Topsoil	
0 - 2	S-1		4 - 6 - 9 - 39	10	15				Brown, Medium Dense, Silty Sand with Gravel (FILL)	
2 - 4	S-2		13 - 6 - 11 - 35	10	17				As Above (FILL)	
						5.0				
5 - 6.8	S-3		5 - 5 - 9 - 50/4"	12	14				As Above, Gray-Brown (FILL)	Cobbles
							EXISTING FILL			
8 - 10	S-4		4 - 7 - 11 - 7	8	18				As Above, Gray (FILL)	
						10.0				
10 - 12	S-5		20 - 22 - 9 - 7	6	31				As Above, Very Dense (FILL)	Cobbles 10 to 11 fbgs Small voids
										Grinding 12 to 15 fbgs Larger rock pieces
						15.0				
15 - 17	S-6		7 - 5 - 1 - 1	6	6				Gray-Brown, Loose, Silty Sand with Gravel (FILL)	
						17.0				
17 - 19	S-7		4 - 12 - 34 - 50	18	46				Brown, Dense, Silty Sand with Gravel (SM)	
						20.0				
20 - 22	S-8		15 - 36 - 40 - 46	14	76		GLACIAL TILL		As Above, Very Dense (SM)	
						25.0			Boring Log B-4 Terminated upon Auger Refusal at Depth of 24.5 fbgs.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/21/2022
Termination Depth:	16.0 feet bgs	**Date Completed:**	3/21/2022
Proposed Location:	Building	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

	Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
During:	15.0	--		
At Completion:	13.5	--	**At Completion:** --	--
24 Hours:	--	--	**24 Hours:** --	--

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil; 2" Subsoil	
0 - 2	S-1		3 - 5 - 6 - 6	18	11				Gray-Brown, Medium Dense, Silty Sand with Gravel (FILL)	
2 - 4	S-2		3 - 2 - 7 - 12	16	9				As Above, Loose (FILL)	
						5.0				
5 - 7	S-3		5 - 4 - 4 - 11	18	8				As Above (FILL)	
7 - 7.5	S-4		22 - 50/0"	6	-				As Above, Dense (FILL)	Cobbles
							EXISTING FILL			
						10.0				
10 - 12	S-5		8 - 10 - 11 - 10	6	21				As Above, Medium Dense (FILL)	
						15.0				
15 - 15.7	S-6		3 - 50/2"	3	-				As Above, Dark Brown, Organics (FILL)	Cobbles
									Boring Log B-5 Terminated upon Auger Refusal at Depth of 16 fbgs.	
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/25/2022		
Termination Depth:	15.5 feet bgs	**Date Completed:**	3/25/2022		
Proposed Location:	Building	**Logged By:**	RK	**During:** -- | --	
Drill / Test Method:	HSA / SPT	**Contractor:**	GS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 850	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1		4 - 6 - 8 - 7	18	14				Brown, Medium Dense, Silty Sand with Gravel (FILL)	
2 - 4	S-2		6 - 7 - 6 - 7	3	13				As Above (FILL)	
						5.0				
5 - 6.3	S-3		4 - 6 - 50/4"	6	12				As Above (FILL)	Cobbles Grinding 6 to 8 fbgs Larger rock pieces
							EXISTING FILL			
8 - 10	S-4		WOH /12" - 2 - 3	3	2				Gray, Very Loose, Silty Sand with Gravel, Organics (FILL)	
						10.0				
10 - 10.8	S-5		20 - 50/5"	6	-				As Above, Dense (FILL)	Cobbles Grinding 11 to 15 fbgs Larger rock pieces
						15.0				
15 - 15.1	S-6		50/1"	1	-				As Above, Very Dense (FILL)	Cobbles
									Boring Log B-6 Terminated upon Auger Refusal at Depth of 15.5 fbgs. Augers abandoned in hole	
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/25/2022
Termination Depth:	4.0 feet bgs	**Date Completed:**	3/25/2022
Proposed Location:	Septic Field	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				Blast rock at surface
							TS		3" Forest Mat	
0 - 2	S-1		10 - 22 - 25 - 33	10	47		EXISTING FILL		Gray-Brown, Dense, Silty Sand with Gravel (FILL)	
2 - 2.3	S-2		50/3"	1	-				As Above (FILL)	Cobbles Offset boring Auger Refusal @ 3.5 fbgs
						5.0			Boring Log B-7 Terminated upon Auger Refusal at Depth of 4 fbgs.	
						10.0				
						15.0				
						20.0				
						25.0				

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WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-8

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/21/2022
Termination Depth:	10.0 feet bgs	**Date Completed:**	3/21/2022
Proposed Location:	SWM Area	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1		2 - 3 - 6 - 6	20	9				Brown, Loose, Silty Sand with Gravel (FILL)	
2 - 4	S-2		7 - 7 - 9 - 8	18	16				As Above, Medium Dense (FILL)	Gray fine sand (pockets)
4 - 6	S-3		8 - 6 - 6 - 5	18	12	5.0	EXISTING FILL		As Above (FILL)	
6 - 8	S-4		3 - 4 - 5 - 6	18	9				As Above, Loose (FILL)	
8 - 10	S-5		6 - 4 - 6 - 6	18	10	9.0			As Above (FILL)	
						10.0	GLACIAL TILL		Brown, Medium Dense, Silty Sand with Gravel (SM)	
									Boring Log B-8 Terminated at Depth of 10 feet below ground surface.	
						15.0				
						20.0				
						25.0				

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WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-9

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/25/2022
Termination Depth:	11.3 feet bgs	**Date Completed:**	3/25/2022
Proposed Location:	Access	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1		1 - 6 - 7 - 6	12	13				Brown, Medium Dense, Silty Sand with Gravel (FILL)	
2 - 4	S-2		11 - 11 - 12 - 13	10	23				As Above (FILL)	
						5.0	EXISTING FILL			
5 - 7	S-3		6 - 8 - 10 - 14	12	18				As Above (FILL)	
7 - 7.8	S-4		15 - 50/3"	6	-				As Above, Dense (FILL)	Cobbles Larger pieces blast rock
						10.0				
10 - 11.3	S-5		18 - 15 - 50/4"	8	30		GLACIAL TILL		Brown, Medium Dense to Dense, Silty Sand with Gravel (SM)	Cobbles
						15.0			Boring Log B-9 Terminated at Depth of 11.3 feet below ground surface.	
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-10

Page 1 of 1

Project:	Proposed Retail Store	**WAI Project No.:**	GM2218961.000
Location:	1682 Connecticut Route 12, Gales Ferry, New London County, Connecticut	**Client:**	Garrett Homes, LLC
Surface Elevation:	± NS feet above NAVD88	**Date Started:**	3/25/2022
Termination Depth:	12.0 feet bgs	**Date Completed:**	3/25/2022
Proposed Location:	Parking	**Logged By:**	RK
Drill / Test Method:	HSA / SPT	**Contractor:**	GS
		Equipment:	CME 850

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1		12 - 8 - 7 - 7	12	15		EXISTING FILL		Brown, Medium Dense, Silty Sand with Gravel (FILL)	
2 - 4	S-2		15 - 12 - 14 - 14	10	26				As Above (FILL)	Grinding 3 to 5 fbgs Larger rock pieces
						5.0				
5 - 7	S-3		8 - 20 - 32 - 18	18	52				As Above, Very Dense (FILL)	Cobbles
7 - 9	S-4		22 - 20 - 15 - 13	16	35	8.0			As Above, Dense (FILL)	Cobbles
							GLACIAL TILL		Brown, Dense, Silty Sand with Gravel (SM)	
						10.0				
10 - 12	S-5		5 - 8 - 23 - 12	10	31				As Above (SM)	
									Boring Log B-10 Terminated at Depth of 12 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

APPENDIX B
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

16 OLD FORGE ROAD
SUITE A
ROCKY HILL, CT 06067
860.726.7889
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM CT.docx

WHITESTONE
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16 OLD FORGE ROAD
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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

Other Office Locations:

WARREN, NJ 908.668.7777 | CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | WALL, NJ 732.592.2101 | PHILADELPHIA, PA 215.848.2323 | BEDFORD, NH 603.514.2230 | TAMPA, FL 813.851.0690

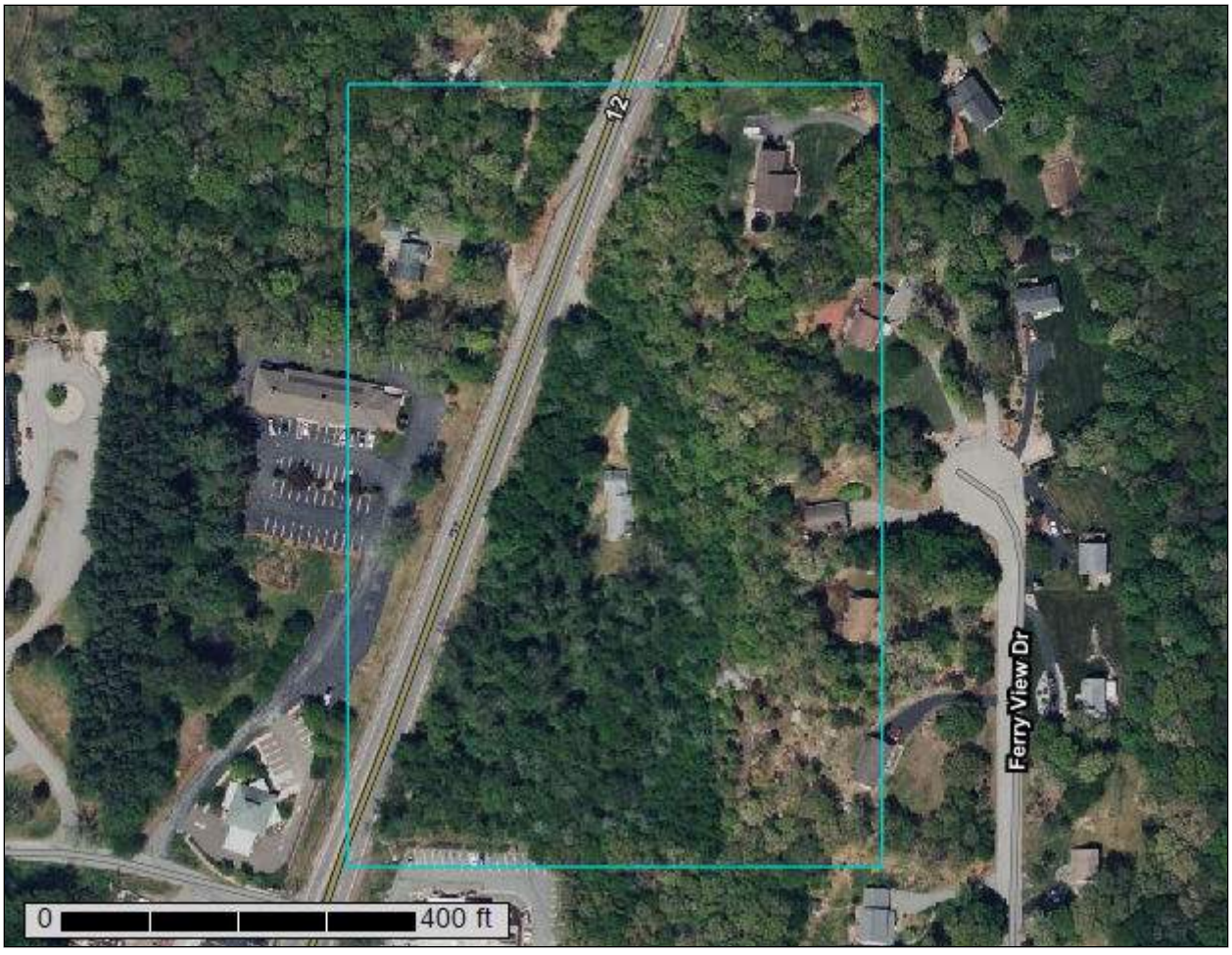
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut



July 7, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,570 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 21, Sep 7, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	0.2	1.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	0.0	0.3%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	2.1	17.1%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	6.4	52.0%
306	Udorthents-Urban land complex	3.2	25.8%
702B	Tisbury silt loam, 3 to 8 percent slopes	0.4	3.4%
Totals for Area of Interest		**12.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit

descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Connecticut

3—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qt
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 40 percent
Leicester, extremely stony, and similar soils: 35 percent
Whitman, extremely stony, and similar soils: 17 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Description of Leicester, Extremely Stony

Setting

Landform: Ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg - 7 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 39 inches: gravelly fine sandy loam
C2 - 39 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B/D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Description of Whitman, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat

A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 7 to 38 inches to densic material
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 6 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Bogs, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

73E—Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 9lql
Elevation: 0 to 1,200 feet

Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 4 inches: fine sandy loam
Bw1 - 4 to 7 inches: fine sandy loam
Bw2 - 7 to 19 inches: fine sandy loam
Bw3 - 19 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Chatfield

Setting

Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Sutton

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Hollis

Percent of map unit: 3 percent
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed, sandy subsoil

Percent of map unit: 1 percent
Hydric soil rating: No

Unnamed, red parent material
Percent of map unit: 1 percent
Hydric soil rating: No

75C—Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting
National map unit symbol: 9lqn
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Hollis and similar soils: 35 percent
Chatfield and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile
Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 9 inches: channery fine sandy loam
Bw2 - 9 to 15 inches: gravelly fine sandy loam
2R - 15 to 80 inches: bedrock

Properties and qualities
Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Chatfield

Setting

Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Charlton
Percent of map unit: 7 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sutton
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, sandy subsoil
Percent of map unit: 1 percent
Hydric soil rating: No

Brimfield
Percent of map unit: 1 percent
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed, red parent material
Percent of map unit: 1 percent
Hydric soil rating: No

75E—Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes

Map Unit Setting
National map unit symbol: 9lqp
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 35 percent
Chatfield and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 9 inches: channery fine sandy loam
Bw2 - 9 to 15 inches: gravelly fine sandy loam
2R - 15 to 80 inches: bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Chatfield

Setting

Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam

Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Charlton

Percent of map unit: 7 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, red parent material
Percent of map unit: 1 percent
Hydric soil rating: No

Unnamed, sandy subsoil
Percent of map unit: 1 percent
Hydric soil rating: No

Brimfield
Percent of map unit: 1 percent
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

306—Udorthents-Urban land complex

Map Unit Setting
National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Typical profile
A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities
Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Typical profile

H - 0 to 6 inches: material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 8 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: No

702B—Tisbury silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07h
Elevation: 0 to 1,260 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Tisbury and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tisbury

Setting

Landform: Outwash terraces, outwash plains, valley trains, deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bw1 - 8 to 18 inches: silt loam
Bw2 - 18 to 26 inches: silt loam
2C - 26 to 65 inches: extremely gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 24 to 36 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F144AY026CT - Moist Silty Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Outwash terraces, moraines, eskers, kames, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ninigret

Percent of map unit: 3 percent
Landform: Kame terraces, outwash plains, kames, outwash terraces, moraines
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group

Map Scale: 1:1,570 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 21, Sep 7, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	0.2	1.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	B	0.0	0.3%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	2.1	17.1%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	6.4	52.0%
306	Udorthents-Urban land complex	B	3.2	25.8%
702B	Tisbury silt loam, 3 to 8 percent slopes	C	0.4	3.4%
Totals for Area of Interest			**12.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX H

Stormwater System Operation and Maintenance Plan

Stormwater System
Operations and Maintenance Plan

For the:
Proposed Retail Facility

Located at:
1682 & 1686 CT Route 12
Town of Ledyard, Connecticut

Prepared for Submission to:
Town of Ledyard, Connecticut

August 1, 2022

Prepared for:
Garrett Homes, LLC
59 Field Street
Torrington, Connecticut

Prepared by:

BL Companies
100 Constitution Plaza, 10th Floor
Hartford, Connecticut 06103
Phone: (860) 249-2200
Fax: (860) 249-2400

BL Project Number: 2102412

Contents

General Overview

This Stormwater Operation and Maintenance Plan shall support the Site Plan Application submitted to the Town of Ledyard by Garrett Homes, LLC for a proposed retail facility located on CT Route 12. The purpose of this Plan is to establish the Operational and Maintenance requirements of the site during and after construction in order to comply with local and state requirements. The plan shall apply to the project site which consists of two total parcels with a total area of approximately 182,118 SF or 4.18 Acres.

The subject parcel described above is bounded to the north by a residential house at 1700 CT Route 12, to the east by residential homes on Ferry View Drive, to the south by McDonald's, and to the west by CT Route 12.

The proposed topography of the site varies from elevation 44 to 122 and will generally follow the existing drainage patterns to the greatest extent feasible. All stormwater inlets and pipes will collect and route the site's runoff to the respective design points. Primary water quality treatment will be provided in a hydrodynamic separator.

The proposed development includes the construction of a +/- 10,700 SF retail building. The development will include parking, landscaping, and additional site and utility improvements typical of commercial development.

The proposed development is located entirely within the FEMA Flood Zone X, an area determined to be outside the 0.2% annual chance floodplain.

The proposed stormwater management system installed for the site complies with the Town of Ledyard Zoning Regulations, the 2002 Connecticut Guidelines for Soil Erosion, and the 2004 Connecticut Stormwater Quality Manual, latest editions.

The following Operations and Maintenance Plan, hereby referred to as Plan, was prepared specifically for the development located within the Town of Ledyard, Connecticut. The Plan was developed to satisfy the requirements of the Connecticut Department of Energy and Environmental Protection's *2002 Connecticut Guidelines for Soil Erosion and Sediment Control.*

Purpose & Goals

The purpose of this Plan is to ensure that the stormwater management components are operated in accordance with all approvals and permits. The primary goal is to inform all property managers on how the system operates and what maintenance items are

necessary to protect downstream wetlands and watercourses. The secondary goal is to provide a practical, efficient means of maintenance, planning, and record keeping, verifying permit compliance.

Responsible Parties

The Property Owner, and other parties as listed below, will be responsible for implementing the Plan for the subject property.

Company:	Garrett Homes, LLC
Business Address:	59 Field Street
	Torrington, CT 06790

Maintenance inspections shall be performed by a qualified professional.

Some utilities located on the site will be owned and maintained by various utility companies in accordance with their standards. The property owner may maintain the service connections and shall coordinate with the corresponding utility provider.

List of Permits & Special Conditions

The project will receive several permits, which may contain special conditions that require compliance by the property owner and maintenance contractors. This permit may include the following:

- Town of Ledyard –Site Plan Approval, Building Permit
- State of Connecticut Department of Transportation – Encroachment Permit

Maintenance Logs and Checklists

The property owner shall keep a record of all maintenance procedures performed, date of inspection/ cleanings, etc. Copies of inspection reports and maintenance records shall be kept on-site and readily available at the request of local municipalities or state authorities.

Upon the request by the Town of Ledyard, all documented inspections, reports, or other supporting information pertaining to this plan shall be provided to the Town annually and submitted per their requirements. The responsibility party shall contact the Town of Ledyard for any pertinent information not specifically noted within this section.

Forms

The following forms shall be developed by the responsible party to record periodic maintenance and inspections. An example of a typical inspection and maintenance form for a catch basin is included within the appendices of this report for reference. All inspection and maintenance forms prepared by the responsible party shall be kept on-site as part of the Stormwater Management Plan.

- Annual Checklist
- Quarterly Checklist
- Monthly Checklist

Employee Training

The property owner will have an employee-training program, with annual updates, to ensure that the qualified employees charged with maintaining the buildings and grounds do so in accordance with the approved permit conditions. All employees that have maintenance duties will be adequately informed of their responsibilities.

Spill Control

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and clean-up:

- Manufacturer's recommended methods for spill clean-up will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include but not be limited to: absorbent booms or mats, brooms, dust pans, mops, rags, gloves, goggles, sand, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned immediately after discovery.
- The spill area will be kept well-ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.
- Spills of toxic or hazardous material, regardless of size, will be reported to the appropriate State or local government agency.

- If a spill occurs, this plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean the spill if there is another one. A description of the spill, the cause, and the remediation measures shall also be included.

A spill report shall be prepared by the property owner following each occurrence. The spill report shall present a description of the release, including quantity and type of material, date of spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

The property owner shall identify an appropriately qualified and trained site employee involved with day-to-day site operations to be the spill prevention and clean-up coordinator. The name(s) of responsible spill personnel shall be posted on-site. Each employee shall be instructed that all spills are to be reported to the spill prevention and clean-up coordinator.

Stormwater Management System and Maintenance

System Components

The stormwater management system has several components that are shown on the Grading and Drainage Plan and perform various functions in capturing, routing, and treating stormwater runoff.

Catch Basins

Catch basins are stormwater inlets, which capture the site's runoff and any road sand and floatable debris prior to draining through the storm sewer system. The proposed catch basins (CBs) are equipped with deep sumps with sump depths below the outlet pipe, and hoods over the outlet pipes.

The property owner is responsible for cleaning the catch basins on the property. A Connecticut Licensed hauler shall clean the sumps and remove and dispose of removed sediment and debris legally. The collected road sand may be reused for winter sanding but may not be stored on-site. The owner shall contact the local municipality for all requirements related to disposal and reuse of sediment. As part of the hauling contract, the hauler shall notify the property owner in writing where the material is being disposed.

Each catch basin shall be inspected every four (4) months, with one (1) inspection occurring during the month of April. Any debris occurring within one foot from the bottom of each sump shall be removed by a Vacuum "Vactor" type, maintenance equipment.

The deep sumps of each catch basin contribute to a portion of the required water quality treatment train. Ignoring the buildup of sediment and debris within each structure over time is a violation against State requirements.

During the inspection of each catch basin sump, the hoods (where provided) on each of the outlet pipes shall also be inspected. In the event that a hood is damaged or off the hanger, it shall be reset or repaired. The inlet and outlet pipes shall be checked for blockages and shall be cleaned and repaired, as needed. All inlet grates at the surface shall be free of leaves and cleaned out each fall to permit proper flow into each basin and minimize the amount of leaf litter entering the system.

Hydrodynamic Separator (Oil/Water Separator)

The hydrodynamic separator inlet will be cleaned periodically during construction, and at the end of construction once the landscaped areas are fully stabilized.

For the first year of operation following construction, inspect each unit once each month for the months of January, February, March and April, and once every four months thereafter. A graduated measuring device (stadia rod) shall be inserted into each grit chamber and measurements of any accumulations shall be recorded. Any debris, which has accumulated to within one foot of the water surface inside the grit chamber portion of each tank, shall be removed by vacuum "Vactor" type of equipment.

After the first year of operation, each unit shall be inspected at a minimum, three times yearly with one inspection occurring in the month of April in the same manner as described above for the first season of operation. Any accumulations found to be occurring within one foot of the water surface shall be removed from the unit and properly disposed off-site. Also, any floating material discovered during inspections shall be removed from the tank.

A detailed maintenance logbook shall be kept for each unit. Information is to include, but not be limited to, the date of inspection, record of grit depth, condition of baffles, observation of any floatable, and date of cleaning performed.

Stormwater Management Basin

The stormwater basins are designed to filter and detain stormwater runoff from contributing watersheds. Wet meadow environments are proposed within the basins to provide biological and physical filtration of runoff prior to discharge. Runoff storage capacity for flood flows is also provided in the system by means of a control outlet structure. The basins are planted to provide soil stabilization, filtration and wildlife habitat.

Management actions include the following measures:

1. Replacement of any diseased or dead vegetation within the basin with native species, as per the approved plan;
2. Inspection and clearing of debris from the basin floor, inlet and outlet structures when necessary. To be inspected quarterly for the first two years and adjusted as necessary, but no less frequently than biennially. Remove sediment from basin floor and low flow channel if accumulation exceeds one foot.
3. Repairs to any soil erosion of the sidewalls or floor of the basin, and;
4. Repairs to the inlet and outlet structures, as needed.

Rip Rap Outlet Protection

The riprap aprons or swales are excavated depressions which are lined with rock riprap to prevent scouring. The depressions permit the dissipation of excessive energy and turbulence associated with the flow of stormwater being discharged from a conduit system.

Management actions include the following measures:

1. Inspect the surface of the scour hole quarterly for the first year and adjust as necessary (but at least annually) to ensure surface is free of debris and the discharge is flowing via sheet flow and not concentrated. Remove accumulated sediment when sediment depth within the scour hole reaches 50% of the total depth. Frequency of cleaning depends on loading rate.
2. Inspect the discharge lip area for low points and down gradient flow areas for active scour or soil erosion. Repair scour and rills with compacted sandy till, and riprap as needed to prevent scouring.

Additional Site Maintenance

Parking Lots

Parking lots and sidewalks shall be swept as necessary by the property owner to removed trash and other debris. The property owner will sweep parking lots on the property in the spring to remove winter accumulations of road sand and is requirement to maintain the functionality of the required stormwater quality treatment.

Landscaping

The management company retained by the property owner shall maintain all landscaped areas. Typical landscaping maintenance shall consist of pruning, mulching,

planting, mowing lawns, raking leaves, etc. Use of fertilizers and pesticides will be controlled and limited to minimal amounts necessary for healthy landscape maintenance and as approved by the Town.

Established lawn areas shall be maintained at a typical height of 3-1/2". This will allow the grass to be maintained with minimal impact from weeds and/or pests. Topsoil, brush, leaves, clippings, woodchips, mulch, equipment, and other material shall be stored off site.

Outdoor Storage

There will be no outdoor storage of hazardous chemicals, de-icing agents, fertilizer, pesticides, or herbicides anywhere around the buildings.

De-icing and Snow Removal & Storage

The use of clean sand may be used to aid in traction. Snow shall be shoveled and plowed from sidewalk and parking areas within 24 hours of the storm's conclusion. Sand accumulation shall be removed from the site at the end of the winter season or appropriate time when seasonal snow has melted. Alternative de-icing methods not specified within this section shall be submitted to the Town of Ledyard for approval prior to use.

MAINTENANCE SCHEDULE

During the First Year of Operation:		
Task:	Completion Date:	Manager's Initials:
JANUARY:		
Employee Training Program with Spill Program		
*Catch Basin and Hydrodynamic Separator Inspection		
FEBRUARY:		
*Hydrodynamic Separator Inspection		
MARCH:		
*Hydrodynamic Separator Inspection		
APRIL:		
*Catch Basin and Hydrodynamic Separator Inspection		
*Infiltration Basin		
Sweeping of Paved Surfaces and Dumpster Enclosure		
Shrub Fertilization		
Lawn Liming (if necessary)		
AUGUST:		
*Catch Basin and Hydrodynamic Separator Inspection		
*Infiltration Basin		
OCTOBER:		
Tree and Lawn Fertilization		
Sweeping of Paved Surfaces and Dumpster Enclosure		
DECEMBER:		
*Catch Basin and Hydrodynamic Separator Inspection		
*Infiltration Basin		

*NOTE: Use appropriate worksheet found in this plan to conduct the inspection.

After the First Year of Operation:			
FOR YEAR_____			
Task:		Completion Date:	Manager's Initials:
JANUARY:			
Employee Training Program with Spill Program			
APRIL:			
*Catch Basin and Hydrodynamic Separator Inspection			
*Infiltration Basin			
Sweeping of Paved Surfaces and Dumpster Enclosure			
Shrub Fertilization			
Lawn Liming (if necessary)			
AUGUST:			
*Catch Basin and Hydrodynamic Separator Inspection			
*Infiltration Basin			
OCTOBER:			
Tree and Lawn Fertilization			
Sweeping of Paved Surfaces and Dumpster Enclosure			
DECEMBER:			
*Catch Basin and Hydrodynamic Separator Inspection			
*Infiltration Basin			

*NOTE: Use appropriate worksheet found in this plan to conduct the inspection.

CATCH BASIN / CATCH BASIN INSERT INSPECTION LOG

Name of Inspector: Date:

Catch Basin ID	Condition (circle one)		Debris above 1' within sump? (If yes then catch basin is to be cleaned)		Date of Catch Basin/Cleaning (if debris is greater than 1')		Condition of Hood (if applicable, remove trash/debris if necessary)	Comments:
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							

On-site Procedures for Inspection and Maintenance of Catch Basin Inserts

• Secure traffic and pedestrian traffic with cones, barrels, etc.

• Clean surface area around each catch basin.

• Remove grates and set aside

• Clean grates, remove litter and debris that may be trapped within the grate

• Visually inspect condition of outlet hood and remove trash and debris from hood if necessary.

• Remove by vactor hose the debris that has been trapped in the trough area. Dispose of in accordance with local, state and federal regulatory agency requirements. Most debris that is captured in the trough or sump area will fall into the non-hazardous waste category.

• Visually inspect and check the condition of the trough area.

• Replace grate and lockdown as needed.

• Un-secure traffic control area.

• Complete service report and submit to facility owner.